Metro-North Railroad

METRO-NORTH COMMUTER RAILROAD COMPANY

SCARSDALE & HARTSDALE STATION IMPROVEMENTS

CONTRACT NO. 100106733

TECHNICAL PROVISIONS

100% FINAL DESIGN
AUGUST 23, 2019

Submitted by:

STV 100 Years

In association with:
LERCH BATES

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PART 1 - GENERAL

1.1 WORK COVERED BY THE CONTRACT DOCUMENTS

A. Project Identification: CONTRACT NUMBER 1000106733: HARTSDALE AND SCARSDALE STATION IMPROVEMENTS

B. Owner: MTA – Metro-North Railroad (Metro-North)

1.2 PROJECT DESCRIPTION

A. Site Locations: The Metro-North stations included in this contract are as follows:
   1. Scarsdale, New York (Harlem Line)
   2. Hartsdale, New York (Harlem Line)

B. Site Description: Descriptions of each of the station sites follows below:
   1. Scarsdale Station:
      a. Located Town-Village of Scarsdale, Westchester County, NY
      b. Elevated station on Harlem Line accessing two tracks. Two side high-level concrete platforms twelve cars long.
      c. Owned and managed by Metro-North

   2. Hartsdale Station:
      a. Located in Town of Greenburgh, Westchester County, NY.
      b. Elevated station on Harlem Line accessing two tracks. Two side high-level concrete platforms twelve cars long.
      c. Owned and managed by Metro-North

1.3 SCOPE OF WORK

A. In summary, this contract covers, but is not limited to installation of new elevators for two Metro-North stations, Hartsdale and Scarsdale, as well as an overpass extension at Hartsdale and overpass jacking at Scarsdale. The overpasses at both stations will receive new furniture, lighting, and heaters. For the specific bid categorization, refer to the bid sheet and the Measurement and Payment section of the specifications.

B. The construction work may be accomplished via a combination of controlled work from various locations on the parking lot side of the platforms. There is no anticipated need for on-track access to utilize Contractor's on-track equipment. If deemed necessary, Metro-North may provide one track access location per station as represented in these documents. Both the working hours and access locations have restrictions. The Contract Documents specify various restrictions and limitations to working on both the on-track and work outside of platforms locations.

C. Hartsdale Scope:

1. Furnish and install two (2) new ADA elevators, all necessary components and equipment, including two (2) new enclosed elevator towers located on each platform side serving ground level to platform level and overpass level. Provide two (2) elevator machine rooms to house equipment adjacent to elevator. Provide new ADA sidewalks from each elevator at ground level.

2. Provide one (1) new elevated walkway connecting the elevator tower to the existing overpass level inbound platform side.

3. Provide fire and smoke alarm system for new elevators.

4. Provide benches, leaning bars, new lighting, and heaters to the existing overpass.

5. Con Edison will upgrade the electrical service, including new primary power feeders. The Contractor shall coordinate with Con Edison for the upgraded power as well as perform all additional electrical scope related to the elevators and overpass scope.

D. Scarsdale Scope:

1. Furnish and install one (1) new ADA elevator, all necessary components and equipment, including one (1) new enclosed elevator tower serving ground level, platform level and overpass level on the inbound platform side. Provide one (1) elevator machine room to house equipment adjacent to elevator. Provide new ADA sidewalks from the elevator at ground level.

2. "Jack" the existing passenger overpass structure and stair/stair enclosure structure to the inbound platform side to meet the required height from top of rail. This "jacking" requires modifications to the threshold to the existing elevator on the outbound side, as well as to the walkway from the sidewalk. An additional step will be added at the top of the outbound stair, and at the bottom of the inbound stair. The modifications and repair are required for the overpass roof canopy, including and not limited to eaves, wood ceiling, terracotta tiles which are severed by "jacking." The work also includes raising the Scarsdale overpass and associated stairs by 7" inches. This raising is expected to be executed via "jacking" techniques. The existing slab from the street, leading to the overpass and associated stairways, shall also be adjusted to meet the elevated overpass. This slab also includes the upper level of the elevator threshold.

3. Demolish existing communications CCTV bungalow on the inbound platform side. Removal of all necessary CCTV equipment and components shall be done by Metro-North or others (see 1.3.H of this specification). Construct new structure adjacent to elevator machine room for the relocation of the CCTV equipment. Relocation of all equipment and components shall be done

by Metro-North or others (see 1.3.H of this specification.) Repair/replace utilities that are damaged by Contractor.

4. Provide benches, counter, leaning bars, new LED lighting and heaters to the existing overpass.

5. Provide fire and smoke alarm systems for elevators, and additional cables for future provisions.

6. Provide connecting platform from elevator platform level landing to station platforms and overpasses.

7. Provide motorcycle/scooter parking at the inbound side (street level) including providing an access driveway to connect Depot Place and the parking lot and providing a gate. During construction protect tree(s) on Westchester County property adjacent to the new access driveway.

E. On-track systems work is not part of this scope.

F. Architectural and/or structural improvements to the station buildings are not part of this scope.

G. The work at the platform level generally consists of maintenance and protection of commuter access; platform slab removal and disposal where needed to place temporary jacking supports, and the replacement of same platform slab (Scarsdale station only)

H. The following list summarizes the work to be performed by **Metro-North or others** but requires extensive coordination:

1. Provide and pull the required cables along the overpass, the contractor shall allow forty (40) days for the lead time and include in the construction schedule.

2. Relocate/Provide new cameras at the overpass, the contractor shall allow three (3) months for the lead time and include in the construction schedule.

3. Disconnect all equipment located inside existing CCTV bungalow and connect to the new cabinet/rack. Label as necessary. The contractor shall allow forty (40) days for the preparation of work and include in the construction schedule.

4. Bring the new Verizon or other carrier's feed to the station. The contractor shall allow two (2) months for the preparation of work and include in the construction schedule.

1.4 MAINTENANCE OF OPERATIONS

A. Contractor cannot commence road/sidewalk and platform staircase closures until all pertinent shop drawings, work plans, schedules are approved, and materials, manpower, and subcontractors are in place to allow for continuous work to take place

B. Within the various work elements noted above, there are requirements that impact the construction which are necessary to allow Metro-North to maintain operations throughout construction. These constraints must be included in the Construction Schedule and Construction Sequencing Plan of the Contractor and adhere to the following:

1. Metro-North shall have uninterrupted access to and the use of the Hartsdale station and Scarsdale station at all times. The Contractor shall coordinate the timing of changeover to new services so as not to disrupt facility operations and passenger access to and from each station platform.
2. This project shall be phased and constructed such that there will be no interruption of passenger service, to include utilization of the Scarsdale Overpass, except during jacking operations. The intent is to perform any work which may cause interruption to passengers at night, and limited weekends.
3. The Contractor shall give, at a minimum, ten (10) business days' notice to Metro- North prior to any interruptions to access to the existing station are, including equipment rooms, elevator rooms, other equipment such as CCTV's, etc.
4. It is understood that this is a construction work zone, and all personnel will wear personal protective equipment.
5. The Contractor shall provide ten (10) business days' notice to Metro-North prior to any interruptions to the electric or gas service. The Contractor shall coordinate schedule and weather/temperature sensitive activities with Metro-North property management. At no time from the beginning of October, through the winter heating season, and until the end of April of the following year, shall the Metro-North Railroad not have use of heating.
6. The Contractor shall provide ten (10) business days' notice to Metro- North prior to any interruptions to the backup generators. The shutdowns shall not commence with a forecast of inclement weather. The Contractor shall check the national weather forecast to verify that no significant storms are imminent before making such a request. The shutdowns shall not commence if there is a forecast of high energy demand for electricity.
7. Disconnections of services to switch from existing to temporary, existing to new or temporary to new shall be coordinated through Metro-North. The Contractor shall provide ten (10) business days' notice to Metro-North prior to any interruptions of any utility service to any of the stations.
8. Prior to work at the site, including demolition, the Contractor shall submit and have approved a detailed Construction Schedule, Staging and Sequencing Plans for construction and commissioning of the new stations in accordance with the contract drawings, specifications, and any other Contract Documents.

PART 2 - PRODUCTS

2.1 DELIVERABLES

A. See Chapter 15 – Submittals of the Contract Terms and Conditions and specification Sections 01 31 00 and 01 33 00 for information on submittals and submittal procedures.

PART 3 - EXECUTION

3.1 GENERAL COORDINATION

A. Coordination to be performed by the Contractor shall include the following:

1. The Contractor is required to coordinate their activities with Metro-North's operations.
2. The Contractor must submit, for approval by Metro-North and the various station location municipalities, detailed plans and procedures for the construction work.
3. The Contractor is responsible for all work associated with utilities, all coordination with utility companies, authorities and municipalities and all payments for all required utility hook-up installations and relocations.
4. Submit project Construction Sequencing Plans to Metro-North for approval. Access and sequencing of all tasks, including mechanical, electrical and plumbing accessories, must be coordinated with Metro-North.
5. All materials shall be amply protected throughout the period of construction and shall be thoroughly cleaned to the satisfaction of Metro-North.

B. This work is being performed adjacent to existing operating train stations and, as such, the Contractor shall coordinate all of its operations with Metro-North. The Contractor must permit the continued uninterrupted access by the railroad, public and employees to each station and maintain safe egress to and from each platform. Any requests for closings of egress points shall be coordinated with Metro-North and comply with State codes, rules and regulations.

C. This work is being performed adjacent to or close to New York State, Town-Village of Scarsdale, Hamlet of Hartsdale, Town of Greenburg, Town of Eastchester, and Westchester County right-of-way and, as such, the Contractor shall coordinate all of its operation with these owners.

D. All Contractor's personnel must be qualified annually on Metro-North On-Track Protection in compliance with CFR 214 in order to enter upon railroad property regardless of the project specific distance from actual tracks.

3.2 PROJECT SCOPE

A. A detailed summary of work can be found in in this specification as well as in Section 01 20 00. Additional work to be performed by the Contractor shall include the following:

1. Temporary construction work for the safe and proper performance of the Contract Work. As required by the work of this Contract, this shall generally include but not be limited to, furnishing and installing the following: (See specifications for additional details.)
    a. Temporary offices – One (1) trailer for field engineer and others to be located at each of the two (2) stations
    b. Temporary utilities, such as electric, water and sanitary
    c. Temporary portable toilet
    d. Rubbish containers
    e. Temporary erosion and sediment control devices
    f. Temporary fences and silt fence to separate the work zone from active roadways
    g. Storage facilities / area
    h. Temporary directional and informational signage
    i. Barrier and other safety requirements to maintain pedestrian and vehicular traffic flow and safety
2. The removal and relocation or disposal shall include, but not be limited to, the following items:
    a. Underground utilities, structures and abandoned duct banks.

b. Building debris – walls, doors, roofs, drop ceilings, light fixtures, glass, wall board, tile, plastic and sheetrock.
c. Bituminous and concrete pavements / sidewalks / curbs
d. Debris and unclassified excavation
e. Landscaping items not limited to trees
f. Any excess materials brought on site by the Contractor for use in construction of the new facilities that are not a part of the final as constructed facilities including equipment and furnishings

3. The excavation, handling, and legal disposal of soil, debris and other contaminated/hazardous and non-hazardous materials within the Contract limits of work. Test the excavated materials to determine what materials need to be removed and disposed of off-site and what material can remain on site for re-use on this project. No excess material is to remain on site.
4. Signing, striping, crosswalks, etc. as required.
5. The construction of utility (above ground and underground) services as required.
6. Site grading including new curbs, pavements and sidewalks, miscellaneous ramps, bollards, and all associated required execution to complete the work.
7. All other work shown on the Contract Documents or specified in the "Contract Terms and Conditions" and as specified herein.
8. The table below delineates the responsibilities between the Contractor ("GC") and Metro-North Force Account ("FA") at Scarsdale Station:

#	Major Work Element		Work Element	Purchase	Install/ Relocate	Disconnect/ Connect	Testing (if needed)
1	Build the new Comm. Room & Elevator Machine Room	a	Install Conduits with pull lines from new Comm Room to the Conduits by the overpass column support	GC	GC	N/A	N/A
		b	Install electrical work.	GC	GC	GC	GC
		c	New comm room lock New elevator room lock	GC	GC (all hardware except for key's core) FA (keying & core installation)		
2	Jacking of Scarsdale Overpass	a	Shutdown of 3rd Rail Power (1 weekend) (TBD)	N/A	N/A	FA	
		b	Splice and reconnect Power Conduits and Cables severed by jacking	N/A	GC		
		c	Install conduit with pull lines along overpass (intercepting Comm lines from OB side)	GC	GC	N/A	N/A

		d	Install fiber cable along overpass to new CCTV Rack/Room	FA	FA	FA	FA
3	CCTV Relocation	a	Relocate CCTV Rack - entire rack and equip	Existing	FA(Relocation)	FA	
		b	CCTV Camera (including mounting)	Existing	FA	FA	FA

3.3 PERMITS AND APPROVALS

A. The Contractor is required to obtain all necessary permits and approvals, as required to complete the work of this Contract, from Metro-North, the Town-Village of Scarsdale, the Town of Greenburg, Westchester County and all other agencies and organizations having jurisdiction. Included within this provision are permitting and approvals required by the prevailing utilities, to include Con Edison.

B. The construction of all items of the various station improvements shall be done in accordance with all applicable Metro-North, federal and state laws, codes, rules and regulations. Metro-North is exempt from the jurisdiction of and so not required to obtain any permits or approvals from local (i.e. town, village, or county) entities when performing work on Metro-North property. When performing work on property of other (i.e. the Town of Greenburg, Village of Scarsdale, and Westchester County Parks) the Contractor is also required to comply with all applicable Metro-North, federal and state laws, codes, rules and regulations, and must obtain local permits in connection with the work.

C. Agencies and authorities have jurisdiction over specific aspects of this project. It shall be the responsibility of the Contractor to prepare all permits and supporting documentation and to obtain all approvals in a timely manner.

D. The work performed shall strictly comply with the New York State Department of Environmental Conservation requirements, including but not limited to soil erosion and sedimentation control.

E. Keep construction areas, access locations and adjacent public highways clean and free from tracked dirt, sand, and construction debris at all times. Provide wheel washing as necessary and as determined by Metro-North and in compliance with NYSDEC Best Management Practices. Provide dumpsters for debris storage and removal. Clean the work area at the end of each day.

F. The existing storm drainage system must be kept clean and maintained during construction. Any silting of inlets or piping due to inadequate sedimentation protection must be remedied prior to completion of construction as ordered by the engineer.

G. Any diesel-powered non-road vehicle, fifty horsepower and greater, that is owned by, operated by or on behalf of, the Contractor shall be powered by ultra-low sulfur diesel fuel and utilize the best available technology for reducing the emission of pollutants.

H. Noise Control:

1. All equipment and operations shall not exceed permissible sound levels for construction and equipment operations established by all Federal, State and local agencies having jurisdiction.
2. All mechanical equipment utilized onsite will conform to the New York State, OSHA, and local noise codes and requirements.
3. Haul routes for mobile construction will be selected to provide the maximum distance possible between the construction site and nearby residential receptors.
4. The placement of idling equipment, air compressors, and generators near noise sensitive receptors will be avoided; such equipment not in use will be powered down.
5. The Contractor is responsible for responding to all summons or complaints and paying any and all fines levied against him/her resulting from noise control code violations. If Metro-North is fined or penalized, in addition to other remedies Metro-North may possess, as a result of the Contractor's violations, said fine or penalty will be deducted from Contract payments that are due the Contractor.

I. Con Edison does not allow lifting over overhead and aerial wires. All lifting operations near these wires shall be coordinated with Con Edison and the costs associated with such work are the responsibility of the Contractor.

J. Only disposal sites and transporters on the Metro-North Department of Environmental Compliance and Services approved list can be used.

3.4 REQUIREMENTS FOR WORK AFFECTING METRO-NORTH

A. Use of Explosives:
1. The handling, storage or use of explosives is prohibited.

B. Use of Cranes:
1. The Contractor shall abide by Metro-North Article 1.23 for crane use.
2. The Contractor shall be responsible for providing all material and labor for crane operation.
3. The Contractor shall maintain a minimum distance of 10 feet away from any live wires but cannot boom over Con Ed feeders regardless of clearance.
4. Any crane used on the project shall be grounded by a minimum 2/0 cable.
5. Cranes and all its parts such as the bracing arms are prohibited from being located directly above existing underground utilities.
6. The following data will be required for all hoisting operations adjacent to train operations:
   a. Sections showing locations of cranes, horizontally, and vertically, operating radii, with delivery of disposal locations shown. The location of the Metro-North and various public property owners right of way should also be shown.
   b. All required data shall be prepared and sealed by a Professional Engineer licensed in New York State.
7. Submit for review by Metro-North, sketches defining the operations of all cranes used in support of construction. Also submit, at Metro-North's request, similar information for cranes or other equipment in use and capable of encroachment as prescribed in Article 1.23.
   a. These sketches shall include planned locations and movements of the equipment, calculations demonstrating the adequacy of the capacity of the crane for the loads, and interface between the footprint of the equipment and the movement of the boom and loads relative to the existing structure and surrounding buildings, the support

grillages and the protection of the existing utilities, and facilities, and any other pertinent details required by Metro-North.

3.5 CONTRACTOR'S USE OF WORK SITE

A. Work site operations are confined to areas permitted by Metro-North, ordinances and permits and to areas for which the Contractor has obtained easements. The Contractor will not be allowed to use any other areas of the site to perform these functions unless approved by Metro-North.

B. Deliveries of material and equipment to the site shall not interfere with the flow of pedestrian and/or vehicular traffic and shall be scheduled accordingly.

C. The Contractor shall not store material and/or equipment upon Metro-North Right-of-Way without the prior approval of Metro-North. If additional storage and work areas, beyond what is available at the site and on Metro-North property, are needed for operations, the Contractor shall secure those areas at no cost to Metro-North.

D. The Contractor shall provide appropriate site security to protect materials, plant and equipment.

E. The Contractor shall protect all existing surfaces and facilities from any damage resulting from construction operations.

F. All materials shall be amply protected throughout the period of construction and shall be thoroughly cleaned to the satisfaction of Metro-North prior to being turned over to Metro-North.

G. Temporary power shutdowns shall be coordinated with Metro-North and Con Edison.

H. Additional Site Restrictions:
   1. The Contractor is advised that there are live Metro-North, Con Edison, etc., overhead and buried power and non-power utilities at each station site. These utilities must be protected at all times to ensure the continuation of operations.
   2. Power feeder cables run aerially on poles and below ground in conduits or duct banks in and around each station. Their location must be identified by the Contractor and verified by Metro-North personnel before the commencement of operations that may interfere with their operation. Non-power utilities must also be identified by the Contractor and verified by Metro-North personnel before the commencement of operations that may interfere with their operation.
   3. Utilities in and around the site are owned and maintained by third party utility companies/agencies. The Contractor shall coordinate with all third-party utility companies/agencies prior to the work in the vicinity of these utilities.

END OF SECTION

SECTION 01 11 01
CONTRACTOR REQUIREMENTS FOR WORK AFFECTING THE RAILROAD

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CONTRACTOR REQUIREMENTS FOR WORK AFFECTING THE RAILROAD

PART 1 GENERAL

1.01 SCOPE

A. This section governs the Contractors planning of activities and performance of work which has the potential to affect the operation of the Railroad, Railroad facilities as well as the general public. The Contractor shall make detailed plans in accordance with all applicable federal, state and local regulations as well as requirements set forth under this contract for any operation which, in the opinion of the Engineer, affects the operation of the Railroad, Railroad facilities or the general public.

B. Submittals:

1. A detailed four week look-ahead schedule in the Metro-North required format detailing the Contractor's tasks.
2. Engineered Erection, Demolition or Other Rigging plans
3. Engineered Sheeting and Excavation Support Plans
4. Engineered Scaffolding Plans
5. Engineered Fall Protection Plans
6. Track Monitoring Data
7. Work Plans
8. Disabling Stored Equipment

C. Related sections include:

1. Metro-North Railroad Contract Terms and Conditions
    a. Contract Article 1.22 Requirements for Performing Work Adjacent to or Within the Right-of-Way of Metro-North
2. Standard Specifications
    a. 01_11_14 Working in Grand Central Terminal
    b. 01_18_01 Protection of Underground Metro-North Facilities
    c. 01_33_60 Safety, Health & Environmental Control

D. References:

1. US Department of Labor (USDOL) Occupational Safety and Health Administration (OSHA)
2. Metro-North Railroad:
    a. Metro-North Company Standards & Technical Provisions

b. Metro-North General Safety Instructions

c. Metro-North Operating Rules

d. Metro-North MW-4 Requirements for Track Inspection, Maintenance and Construction

e. Metro-North Electrical Operating Instructions MN-290

f. Metro-North Roadway Worker Safety Manual

g. Metro-North Station Standards & Guidelines

h. TS-2000 Track Clearance Diagrams

i. TS-2001-Sheet 1-Third Rail Clearance Diagrams

j. TS-2001-Sheet 2-Minimum Roadway Clearances

1.02 FOUR WEEK LOOK-AHEAD SCHEDULE

A. The Contractor shall submit a detailed four week look-ahead schedule at the end of every week that projects the Contractor's activities for four weeks beginning on the Monday after submission. The four week look-ahead schedule shall include the name of the scheduled activity, work shift start time and finish time, technical submittal status, inspection hold point if applicable, work plan submittal status, safe work plan submittal status, responsible Contractor and the projected time frame to complete each scheduled activity respectively.

B. The four week look-ahead schedule shall also project the Contractors requirements for Metro-North protective personnel, track and power outages to complete each activity. Requests made on the four week look-ahead for future protective personnel, track outages and power outages must be made in accordance with the contract terms and conditions.

C. Metro-North will not schedule protective personnel, track outages, Railroad power outages nor will the Contractor be allowed to work on activities that do not have approval on all submittals required for performance of the work.

D. Costs incurred by the Contractor for work stoppage or negative schedule impacts from a failure to abide by these requirements shall be borne by the Contractor.

1.03 RAILROAD PROTECTIVE PERSONNEL

A. General:

1. The Contractor is advised that during the course of the work Railroad protective personnel (Flagmen, Pilots and Groundmen) and track outages may be required.

a. Metro-North will furnish the services of all protective personnel as required by Metro-North to protect the operation and safety of train traffic and construction throughout the duration of this Contract. The

requirement for protective personnel will be at the sole discretion of Metro-North.

b. If the Contractor fails to notify Metro-North of a request for protective personnel in accordance with the Contract Article 1.22, the availability of protective personnel cannot be assured.

c. Cancellation of requests for protective personnel shall be received by Metro-North a minimum of ninety-six (96) hours prior to the scheduled work. Failure to notify Metro-North of work cancellation prior to this deadline shall result in the Contractor bearing all costs for protective personnel and related Metro-North costs (see Contract Article 1.22.H Protective Personnel).

d. If protective personnel are scheduled to work and no work is performed by the Contractor, the costs for the protective personnel and related Metro-North costs shall be borne by the Contractor. No charges will be incurred by the Contractor for scheduled protective personnel unable to work due to cancellation of the work for reasons beyond the Contractor's control such as inclement weather or Metro-North emergency.

e. The Contractor shall reimburse Metro-North for the above-noted charges within a reasonable time as determined by Metro-North. Failure to reimburse Metro-North will result in deduction of the charges from any moneys due the Contractor under this or any other contract with Metro-North or its affiliates.

f. The presence of a Metro-North Flagger (if any) shall not relieve the Contractor of responsibility for taking all proper precautions, especially in the vicinity of tracks and high voltage electrical circuits.

B. In the event of emergencies, the Contractor shall immediately do the necessary work, as directed by Metro-North, to restore the operation to a safe condition, and upon failure of the Contractor to implement the Engineer's orders immediately, Metro-North, at the expense of the Contractor may take whatever steps it deems necessary to restore the operation to a safe condition. In the event of an emergency creating danger to life or property at or near the site of the work, Metro-North may do anything necessary to alleviate such an emergency situation, including performing work, or directing another contractor to perform work. (See Contract Article 1.22.F Emergency Operations.)

C. The Contractor is notified that only one (1) conductor flagman shall be provided per station as required by Metro-North.

1.04 TRACK AND POWER OUTAGES

A. **Continuous track outages**: There will be **no** continuous track outages.

B. **Single track outage**:
   1. Weeknight (Monday – Thursday) – 1:10 AM to 4:30 AM
   2. Weekend Night (Friday – Sunday) – 1:10 AM to 4:30 AM (availability solely based upon no other conflicting events or programs – e.g. Yankee Games)

C. **Double Track Outage**:
   1. Weekend night (Friday or Saturday) – 2:50 AM to 4:30 AM (availability solely based upon no other conflicting events or programs – e.g. Yankee Games)

Construction Operation	Outage
Installation of temporary 8 ft. barrier along inbound platform (as shown in plans)	Main Line Track 2 Single track outage
Rearrange the utility lines under the platform and set the timber mat foundation for temporary support structure 2 (as shown in plans)	Main Line Track 2 Single track outage
Install new conduits along the outside of the overpass to allow for the lifting of the overpass (as shown in plans)	Main Line Track 1 Single track outage or Main Line Track 2 Single track outage (depending on the location of installation
Disconnect utilities attached along the outside of the overpass	Main Line Track 1 Single track outage or Main Line Track 2 Single track outage (depending on the location of installation
Other activities which may foul the track adjacent to the work location	Main Line Track 1 Single track outage or Main Line Track 2 Single track outage
Jacking Scarsdale overpass	Double track outage

D. Contractor shall dedicate the first half hour and last half hour of each outage period as defined by the track outage schedule for Metro-North to de-energize and re-energize the third rail system.

E. The Contractor is notified that certain construction operations may require obtaining a track outage from the Railroad. The Contractor shall assume that any and all

operations which foul an adjacent live track may require a track outage. Fouling of the track is defined in the Contract Article 1.22.B Protection of Metro-North.

1. A track outage shall constitute the removal of a track or traction power systems from service by the Railroad.

2. The durations listed in the track outage schedule indicate the time track shall be removed from service and the time track shall be returned to service. The schedule is not inclusive of Contractor's actual working time on track. The primary goal of Metro-North is the safe operation of trains, therefore certain locations on the system may not be available for a normal Contractor 8 hour actual working time on track.

F. General:

1. All requests for short term track outages must be submitted to the Engineer in writing no later than fourteen (14) days prior to the outage.

    a. Track outages that require Metro-North to provide bussing to customers require the Contractor to provide all applicable outage requests and approved submittals a minimum or three weeks prior to scheduled work.

2. The written request shall include, as an attachment, a "four week look ahead schedule," in the required format, showing for each day, the requested outages (track/power), request for Metro-North flagman/pilot, an approved work plan detailing activities to be performed and hours of work at each location whether requiring an outage or not and hours of use or movement of all rail mounted equipment.

3. Restrictions on Track Outages

    a. Off peak Track outages will be subject to holiday restrictions in accordance with Contract Article 1.22.I Holiday Restrictions.

    b. At all times Contractor shall be prepared to immediately discontinue her or his operations and return the track for Railroad operations, when directed by the Engineer.

    c. Any and all requests for traction power shut-offs shall be submitted concurrently with requests for track outages.

    d. The Contractor is advised that the work site is an operating railroad and she or he shall be required to coordinate all of her or his operations with those of Metro-North and other (3rd Party) Metro-North Projects.

    e. The use of on-track equipment is not permitted with Foul Time.

G. The Contractor shall, prior to obtaining track usage, make all preparations for on track work in an effort to maximize the Contractor's use of the track. Failure to do so may result in the costs for any ineffective use of railroad protective services to be borne by the Contractor.

H. The Contractor shall dedicate sufficient time in each period to restore the track to a fully operational mode, as determined by the Engineer. The Contractor shall also be responsible for any additional time and action required to return track to acceptable use from impact of Contractor operation.

1. Restoration of track to fully operational mode is subject to inspection of the Metro-North Track, Signal and Power Department personnel.

1.05 USE OF RAIL MOUNTED EQUIPMENT

A. The Contractor is advised that contract work may require use of rail mounted equipment in the performance of the Work. No Railroad owned equipment will be made available for use by the Contractor.

B. All equipment shall be inspected and approved by the Railroad prior to its use on Railroad property. Equipment shall be inspected at Metro-North's yard at 353 Parkway Homes Road North White Plains, New York, or at another site to be designated by the Railroad.

1. The Contractor shall submit an equipment-inspection request to Metro-North a minimum of two (2) weeks prior to the anticipated inspection date. The Contractor shall coordinate with Metro-North to determine time and location for equipment inspection.

2. The Contractor shall include, along with the inspection request, a copy of Metro-North Hi-Rail Inspection Form with pertinent information filled out. Contractor shall provide the original form on the date of inspection.

3. The Contractor shall have an operator present at the time of inspection.

4. Hi-Rail equipment shall be inspected prior to work and must be re-inspected every 3 months.

5. Re-inspection and approval will be required for any Hi-Rail equipment that has been altered, repaired or has left Metro-North property.

C. Prior to daily operation of rail mounted equipment the operator is responsible to conduct a daily safety and equipment inspection of the vehicle. Inspection shall be documented on the provided "Contractor Daily Hi-Rail Vehicle Inspection" form and submitted monthly for each vehicle while equipment is in use.

D. Contractor's Safety Engineer or Competent Person will lead a Hi-Rail Job Safety Briefing with all operators of rail mounted equipment. The safety briefing will be documented on the provided "Contractor Daily Hi-Rail Job Safety Briefing."

E. All Contractor rail mounted equipment operators shall be trained in the operation of the vehicle and the vehicle's rail gear. The Contractor shall submit to the Engineer the qualified operator's credentials including:

1. Commercial Driver's License

2. Previous experience working with rail mounted equipment (list railroads with experience, dates of work and type of rail mounted equipment operated).

3. Documented training in use of each piece of rail mounted equipment. This training to be provided by "in-house mechanic" for owned equipment or equipment rental vendor for rented equipment.

F. Access for Hi-rail vehicles shall take place from locations noted or other location as approved by Metro-North.

G. The Railroad will provide a pilot (conductor flag) to accompany each piece of rail mounted equipment to, from, and at the work locations. Arrangements to order, cancellation of, and all other requirements for a pilot are the same as for conductor flags.

H. The Contractor is restricted from traveling through self-guarded frogs and switch point guards at no more than 1 MPH.

I. Metro-North Contractor's Hi-Rail Inspection and Vehicle/Equipment Requirements:

1. Prior to scheduling an inspection, all Contractors shall perform a pre-inspection on the vehicle/equipment. Failures will result in re-scheduling at the next available opening.

2. Contractor shall provide a copy of the Hi-Rail Manufacturer's specifications Front and Rear, including model numbers, guide wheel gage measurement, guide wheel and flange specifications and guide wheel load shall be provided. Failure to provide manufacturer's specifications will result in the equipment not being inspected.

3. The guide wheel gage shall be to manufacturer's specifications.

4. Tram measurement (diagonal measurement from center of front left guide wheel to center of rear right guide wheel vs. diagonal measurement from center of front right guide wheel to center of rear left guide wheel) shall not exceed 1/4 inch.

5. Guide Wheel Load shall be within manufacturer's specifications.

6. Wheel bearings and wheel seals shall be in satisfactory condition and greased.

7. Guide wheel and flanges shall be within manufacturer's specifications.

8. Rail brake components (brake shoes and rigging) shall be complete and in working order.

9. Steering lock shall be installed to prevent steering from turning.

10. Hydraulic cylinders and pump shall be in working order.

11. Hydraulic hoses and fittings shall be in satisfactory condition and no leaks.

12. Control levers shall be installed and in satisfactory condition.

13. Lifting handle for manual Hi-Rails shall be on board if applicable.

14. Rail sweeps when provided by manufacturer, shall be in working order.

15. Lock pins or acceptable means of preventing Hi-Rail cylinders from drifting shall be installed.

16. All lights (headlights, brake lights, travel lights, turn signals, marking lights, backup lights, work lights, flashers, strobe lights with 360° visibility), shall be operational. When operating on rails, with the vehicle/machine in the forward travel position, the headlights, travel and brake lights shall operate as normal. When traveling on rails in the reverse position, additional headlights, travel and brake lights shall be installed in the opposite orientation. Lighting circuit operation shall be such that when traveling forward on rails, only the front headlights and rear travel/brake lights are operational. When traveling in reverse on rails, only the rear headlights and front travel/brake lights operate.

17. All horns, change of direction and backup alarms shall be operational.

18. Suspension components shall be in satisfactory condition.

19. Tires shall be in satisfactory condition and air pressure checked. (Tire pressure affects traction and braking on Hi-Rail).

20. Booms and rotating upper structures shall have a boom cradle and/or pivot lock.

21. Tow tab(s) with a 1-1/8 inch hole and tethered pin shall be installed front and/or rear at 14 inches above rail when on Hi-Rail.

22. Rail clamps shall be installed when working from the side of a vehicle/machine, (i.e. lifting booms, rotary dumps, etc.) Exemptions for equipment with counterweights, suspension locks and manufactures approval shall be granted.

23. There shall be no fluid leaks.

24. 3rd rail clearance: Vehicle\equipment and components (i.e. steps, brackets, tool boxes), shall not extend beyond 24 inches measured from the inside of

ball of rail, at a height below 10-7/8 inches, measured from the top of rail (see 3rd rail clearance diagram).

25. A First Aid kit, Flagging kit and Fire Extinguisher with a current inspection date shall be readily accessible.

26. Clearance for self-guarded frogs shall be a minimum of 2-3/4 inches above rail on all under carriage components.

27. Outriggers shall clear 3rd rail, electrical boxes, platforms, switch controls, etc. and secured to prevent drifting.

28. Max height shall not exceed 14 feet and 10 inches while traveling on rails in accordance with Metro-North Park Ave Tunnel diagram.

29. Max width shall not exceed 10 feet and 6 inches while traveling on rails in accordance with Metro-North Park Ave Tunnel diagram.

30. All components that are capable of drifting, swinging, opening, etc. (i.e. booms, jibs, outriggers, tool box doors, engine covers, etc.) shall be secured appropriately before traveling on rails.

J. Metro-North and Contractor's Push Cart Inspection

1. A declaration of intended use, listing all equipment/cargo that is to be transported, must be supplied at time of inspection.

2. The guide wheel gage shall be to manufacturer's specifications.

3. Tram measurement (diagonal measurement from center of front left guide wheel to center of rear right guide wheel vs. diagonal measurement from center of front right guide wheel to center of rear left guide wheel) shall not exceed 1/4 inch.

4. Wheel bearings and wheel seals shall be in satisfactory condition and greased.

5. Guide wheel and flanges shall be within manufacturer's specifications and be of Association of American Railroads profile.

6. Carts must have at least 1-foot tall lettering to identify carts maximum length, width, tare weight and gross weight.

7. All carts must have parking / emergency brakes that deploy with a lack of energy source (i.e. hydraulic / pneumatic pressure).

8. All carts with a rated capacity of 5,000 lbs. and above shall have service brakes with connections on both ends of the cart.

9. All carts with a rated capacity of 5,000 lbs. and under shall have a secondary means of securement to the tow vehicle in addition to the tow bar (i.e. safety chain with spring loaded safety hasps).

10. Rail brake components (brake shoes and rigging) shall be complete and in working order.

11. Hydraulic hoses and fittings shall be in satisfactory condition and exhibit no leaks.

12. Any equipment loaded on cart that has a boom and/or rotating upper structure must have boom cradle and/or pivot lock.

13. Rail clamps shall be installed when working from the side of a cart with machinery (i.e. lifting booms, excavators, etc.).

14. Tow tab(s) with a 1-3/16 inch hole and secure tethered pin shall be installed front and/or rear at approximately 14 inches above rail when on Hi-Rail. If pintle receiver is used, a toe tab adaptor plate must be supplied.

15. There shall be no fluid leaks.

16. 3rd rail clearance: Cart and components (i.e. machinery, steps, brackets, tool boxes) shall not extend beyond 24 inches measured from the inside of ball of rail, at a height below 10-7/8 inches, measured from the top of rail.

17. Cart and components (i.e. machinery, steps, brackets, tool boxes), shall not extend beyond the Metro-North Park Ave Tunnel.

18. Cart and components (i.e. machinery, steps, brackets, tool boxes), shall not extend beyond the Metro North Minimum.

19. Clearance for self-guarded frogs shall be a minimum of 2-3/4 inches above rail on all under carriage components.

20. All components of the cart and any loaded cargo must clear the 3rd rail, electrical boxes, platforms, switch controls, etc. and be secured to prevent drifting.

21. All components that are capable of drifting, swinging, opening, etc. (i.e. booms, jibs, outriggers, tool box doors, engine covers, etc.) shall be secured appropriately before traveling on rails.

22. Cart shall meet on track testing requirements up to and including 22 degrees of curvature.

K. Final approval of items not covered in this part that may be considered questionable, unsafe or cause any danger, shall be at the inspectors discretion.

L. The Contractor is advised that Metro-North may elect to have each two pieces of Hi-Rail equipment coupled together with tow bars for transport to the work location. Each piece of equipment shall have a driver/operator.

M. An emergency spill kit shall be readily accessible and be able to be deployed quickly in the event of a spill.

N. Refer also to FRA 49CFR214.503 to .533 for rules as they apply to Roadway Maintenance Machines and Hi-Rail Vehicles.

1.06 REQUIREMENTS FOR WORK NEAR ENERGIZED EQUIPMENT

A. All work by the Contractor or her or his Subcontractors near “energized” equipment must be performed under the supervision of Metro-North’s Power Department.

B. The Contractor shall submit written request to the Engineer fourteen (14) calendar days prior to the start of her or his work near energized equipment.

C. Third Rail Requirements:

1. Metro-North’s third rail traction power system can be de-energized if, in the opinion of the Engineer, the Contractors work dictates such an outage. Generally, those operations that require the Contractor to place equipment or perform work on or immediately adjacent to the track will require an outage.

2. Contractor shall submit requests to de-energize the third rail in concurrence with requests for track outages.

3. Contractor shall designate the first half hour and last half hour of each track outage period for Metro-North to de-energize and re-energize the third rail system.

1.07 REQUIREMENTS FOR WORK NEAR OVERHEAD WIRES

A. All work by the Contractor while occupying track, adjacent to the track and work with equipment that has the extended reach to foul or enter a distance 10 feet from overhead wires and electrical apparatus is subject to the approval and supervision of a Metro-North Class A Power Department employee.

B. The Contractor shall organize and coordinate outages for all utility company owned overhead wires. Utility company outages will be required if Contractor employees, equipment or material will enter within 15 feet of utility company overhead wires.

C. The Contractor shall submit requests for overhead wire outages and for other Metro-North Class A support as outlined in this section in concurrence with track outage requests or otherwise, if no track outage is required, fourteen (14) calendar days prior to the work commencing.

D. Overhead power will be required to be de-energized at the discretion of a Metro-North Class A Power Department employee in the event that:

1. Unqualified Contractor employees need to work or enter within, by extended reach, 10 feet of any overhead wires or electrical apparatus.

2. Contractor equipment and material may enter within 10 feet or foul overhead wires or electrical apparatus.

3. A Metro-North Blue Tag Qualified Contractor lineman needs to work or enter within, by extended reach, 3 feet of overhead wires or electrical apparatus.

E. Contractor employees who are qualified as Journeyman Lineman are required to attend Metro-North Contractor Linemen Orientation Training provided that documentation supporting the employee's qualifications are provided along with the Contractors protective procedures. Upon completion of the orientation the employee will receive a numbered "Blue Tag" identifying the employee as qualified and is to be visible while the employee is working as a lineman.

F. The following procedures are to be followed in the event an outage is required:

1. Contractor shall note requirements for outages on the four week look ahead and work plans.

2. Prior to beginning work the Contractor's employees and Metro-North support personnel shall review work for the shift during the job safety briefing. Discuss needs for trolley and side power outages as well as required length of work zone for placement of ground cables.

3. Once the overhead wires are de-energized, tested and grounded to enclose the Contractors work area the Contractor's representative must sign Metro-North Clearance Form MP260 to indicate that the Contractor Representative has been instructed and will confine Contractor work within the limits outlined to her or him by Metro-North. Contractor shall not begin work under the outage until clearance to do so is provided.

4. Contractor shall understand that there may be adjacent energized wires near the work area and that the proper safe clearances to those energized wires must be maintained.

5. Contractor, at their own option, may choose to place their own ground cables inside of the Metro-North applied grounds.

6. Contractor shall notify Metro-North when work is complete, Contractor grounds are removed and all personnel are clear. Contractor Representative shall sign Metro-North Clearance Form MP260 indicating that she or he has been advised that the wires will be energized and all her or his forces shall remain at a safe distance from the wires.

G. In the event of a conflict, the Contractor shall comply with all current Metro-North Power Department requirements as those requirements shall supersede the requirements set forth in this specification.

H. The Contractor shall designate the first hour and last hour of a catenary system outage for Metro-North to de-energize and re-energize the system for operation.

1.08 REQUIREMENTS FOR WORK PLANS

A. Contractor shall submit for approval detailed work plans pertaining to work being performed on or about the right of way. Work plans shall be specific to location or task being performed. Contents of work plans shall include:

1. Description of work to be performed
2. Detailed means and methods in which work will be performed
3. Contractor shall specify how any uncompleted work will be secured at the end of the shift
4. List of equipment that will be utilized to complete the work
5. Contractor's crew size and number of work crews required to perform the task.
6. Access location(s) to the work site
7. Time requirements for work to be performed
8. Track usage requirements
9. Power outage requirements
10. Safe Work Plan number and submittal number
11. Rigging Plan submittal number
12. Scaffolding plan submittal number
13. Shoring plan submittal number
14. Fall Protection plan submittal number

B. The Contractors method of performing work specified in this section shall first be submitted to the Engineer for approval and may not be performed without such approval. The approval of the Engineer shall not release the Contractor from any of its obligations under this Contract.

1.09 REQUIREMENTS FOR ENGINEERED ERECTION, DEMOLITION, OR OTHER RIGGING

A. Comply with requirements provided in Contract Article 1.22.C Requirements for Erection, Demolition, or Other Rigging Operations Over or Adjacent to Metro-North Right-of-Way.

1. Provide, for approval by the Engineer, all information listed under Contract Article 1.22 and checklist (found in Section 2.02 of this Specification) in a comprehensive submittal for each rigging operation.

a. Prior to commencement of work Contractor shall ensure adequate location of all underground public, private and Metro-North utilities.

1.10 REQUIREMENTS FOR ENGINEERED SHEETING AND SHORING

A. Comply with requirements provided in Contract Article 1.22.D Requirements for Sheeting for sheeting requirements for excavations within the Railroad live load influence line. All other excavations outside the Railroad influence line shall comply with requirements set forth under Specification Section 01 33 60 Safety, Health & Environmental Control.

1. Provide, for approval by the Engineer, all information required under the above referenced Contract Article 1.22 and checklist (found in Section 2.03 of this Specification) in a comprehensive submittal prepared by a Professional Engineer (PE) licensed in the state that the work is being performed in for each location requiring shoring.

a. Submittal shall include distances of excavation from edge of tie, excavation size and depth.

b. Prior to commencement of work Contractor shall ensure adequate location of all underground public, private and Metro-North utilities.

1.11 REQUIREMENTS FOR SCAFFOLDING

A. Comply with requirements in Contract Article 1.22.E Requirements for Scaffolding as well as Specification Section 01 33 60 Safety, Health & Environmental Control for all scaffolds constructed.

1. Provide, for approval by the Engineer, all information required under the above referenced Contract Article 1.22, Specification Section 01 33 60, and checklist (found in Section 2.04 of this Specification) in a comprehensive submittal for each location requiring erection of scaffolds.

1.12 REQUIREMENTS FOR ENGINEERED FALL PROTECTION PLANS

A. Comply with requirements in Specification Section 01 33 60 Safety, Health & Environmental Control for site specific fall protection plans.

B. Provide, for approval by the Engineer, a fall protection plan prepared by a PE licensed in the state that the work is being performed in and checklist when anchorages, vertical and horizontal lifelines are to be used.

1. Engineered fall protection plans shall include location specific details, product data and calculations showing compliance with OSHA regulations.

1.13 REQUIREMENTS FOR TRACK AND CLEARANCE MONITORING

A. Comply with requirements in Contract Article 1.22.B Protection of Metro-North for track and clearance monitoring requirements.

1. Survey data for track monitoring before, during and after excavations within the railroad live load influence line shall be obtained at a distance at 25-foot centers as follows:

a. From the top of both running rails on each affected track for monitoring of vertical alignment.

b. From the centerline of each affected track for monitoring of horizontal alignment.

2. Survey data for track clearance monitoring before, during and after erection of new permanent or temporary structures above or adjacent to track(s) shall be obtained at 25-foot centers as follows:

a. From the top of both running rails on each affected track to the structure for monitoring of vertical clearance.

b. From the centerline of each affected track to the structure for monitoring of horizontal clearance.

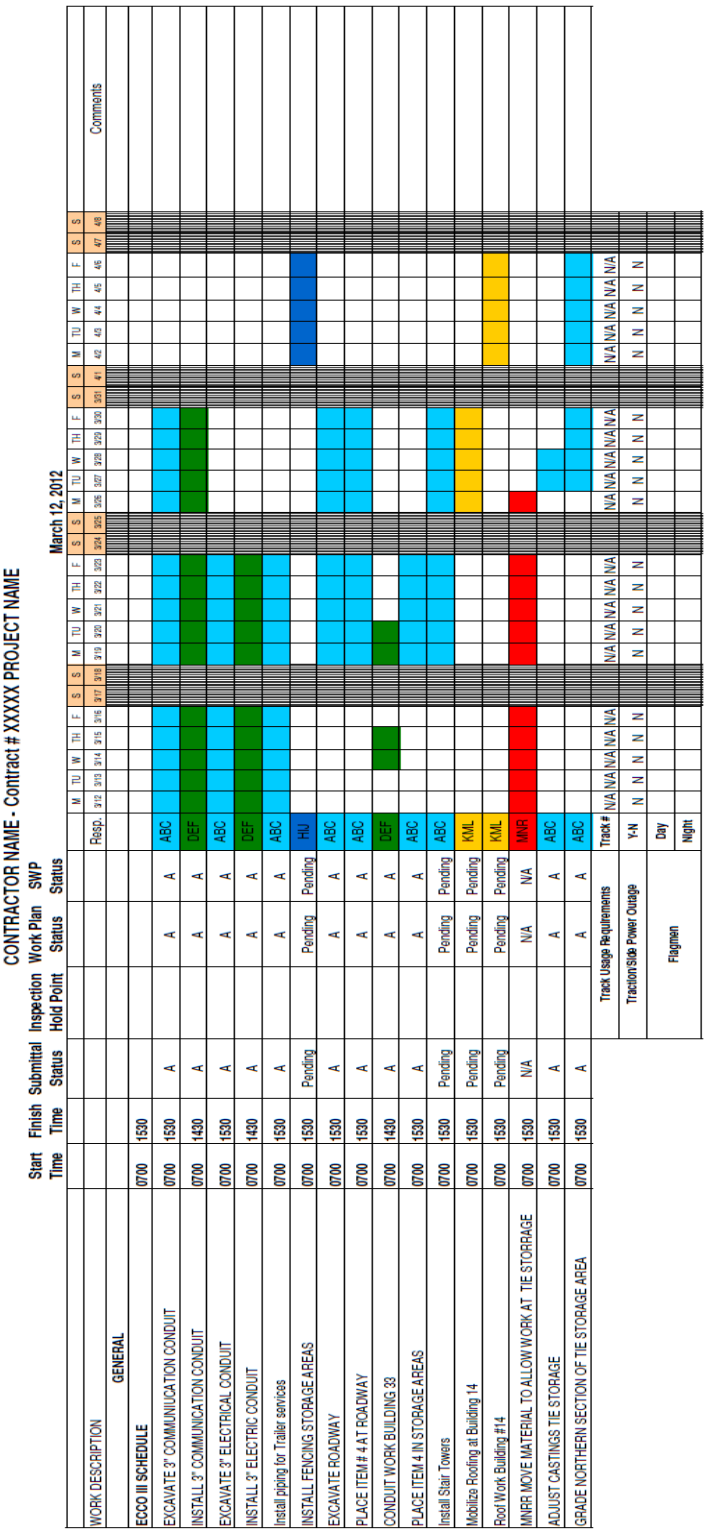
1.14 REQUIREMENTS FOR DISABLING OF EQUIPMENT

A. Contractor shall submit for approval a detailed plan for disabling of equipment stored on Metro-North property. Equipment shall be disabled in a unique manner that it may not be operated or relocated by any personnel not employed by the Contractor.

PART 2 DELIVERABLES

2.01 FOUR WEEK LOOK-AHEAD

A. Metro-North Railroad four week look-ahead sample format:



CONTRACTOR NAME - Contract # XXXXX PROJECT NAME

March 12, 2012

WORK DESCRIPTION	Start Time	Finish Time	Submittal Status	Inspection Hold Point	Work Plan Status	SWP Status	Resp.	M 3/12	TU 3/13	W 3/14	TH 3/15	F 3/16	S 3/17	S 3/18	M 3/19	TU 3/20	W 3/21	TH 3/22	F 3/23	S 3/24	S 3/25	M 3/26	TU 3/27	W 3/28	TH 3/29	F 3/30	S 3/31	S 4/1	M 4/2	TU 4/3	W 4/4	TH 4/5	F 4/6	S 4/7	S 4/8	Comments
GENERAL																																		
ECCO III SCHEDULE	0700	1530																																
EXCAVATE 3" COMMUNICATION CONDUIT	0700	1530	A		A	A	ABC																											
INSTALL 3" COMMUNICATION CONDUIT	0700	1430	A		A	A	DEF																											
EXCAVATE 3" ELECTRICAL CONDUIT	0700	1530	A		A	A	ABC																											
INSTALL 3" ELECTRIC CONDUIT	0700	1430	A		A	A	DEF																											
Install piping for Trailer services	0700	1530	A		A	A	ABC																											
INSTALL FENCING STORAGE AREAS	0700	1530	Pending		Pending	Pending	HIJ																											
EXCAVATE ROADWAY	0700	1530	A		A	A	ABC																											
PLACE ITEM # 4 AT ROADWAY	0700	1530	A		A	A	ABC																											
CONDUIT WORK BUILDING 33	0700	1430	A		A	A	DEF																											
PLACE ITEM 4 IN STORAGE AREAS	0700	1530	A		A	A	ABC																											
Install Stair Towers	0700	1530	Pending		Pending	Pending	ABC																											
Mobilize Roofing at Building 14	0700	1530	Pending		Pending	Pending	KML																											
Roof Work Building #14	0700	1530	Pending		Pending	Pending	KML																											
MINRR MOVE MATERIAL TO ALLOW WORK AT TIE STORAGE	0700	1530	N/A		N/A	N/A	MNR																											
ADJUST CASTINGS TIE STORAGE	0700	1530	A		A	A	ABC																											
GRADE NORTHERN SECTION OF TIE STORAGE AREA	0700	1530	A		A	A	ABC																											
Track Usage Requirements							Track #	N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A	N/A	
Traction/Side Power Outage							Y-N	N	N	N	N	N			N	N	N	N	N			N	N	N	N	N			N	N	N	N	N	
Flagmen							Day																											
							Night																											

A - APPROVED, S - SUBMITTED

Inspection Hold Point: Time allowed for special inspections or contract work (IE rebar or concrete inspections). Time allowed for MN inspection of work that affects the safe operation of the Railroad.

2.02 RAIL MOUNTED EQUIPMENT

A. Metro-North Railroad Quarterly Contractors Machine & Hi-Rail Gear Inspection form:

SECTION 01 11 01
CONTRACTOR REQUIREMENTS FOR WORK AFFECTING THE RAILROAD

METRO-NORTH RAILROAD QUARTERLY
CONTRACTORS VEHICLE/MACHINE AND HI-RAIL GEAR INSPECTION

11/12/2018

PROJECT MANAGER WORK ORDER # ____ ____ ____ ____ ____ MNR WO# ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

UNIT / PLATE #:_____ DATE: _____

MACHINE NAME:_____ VEHICLE MAKE/MODEL: _____

CONTRACTOR NAME:_____ HI-RAIL MANUFACTURER: _____

LOCATION:_____ LAST DATE INSPECTED: _____

MNR PROJECT MANAGER:_____PHONE_____ EMAIL: _____ FAX:_____

HI-RAIL GEAR INFORMATION & MEASUREMENTS			
	MODEL#	GUIDE WHEEL GUAGE (INCHES)	TRAM (INCHES) / MUST BE WITHIN 1/4"
		MANUFACTURERS SPECS ACTUAL MEASUREMENT	LEFT FRONT TO RIGHT REAR: _____
FRONT:	_____	_____ _____	RIGHT FRONT TO LEFT REAR: _____
REAR:	_____	_____ _____	DIFFERENCE: _____

HI-RAIL CHECKLIST	N/A	PASS	FAIL	REPAIRED
1) WHEEL BRGS & SEALS	___	___	___	___
2) RAIL WHEELS	___	___	___	___
3) RAIL WHEEL FLANGES	___	___	___	___
4) RAIL BRAKES & RIGGING	___	___	___	___
5) GUIDE WHEEL LOAD	___	___	___	___
6) STEERING LOCK	___	___	___	___
7) HYD. CYLINDERS & PUMP	___	___	___	___
8) HYD HOSES & FITTINGS	___	___	___	___
9) CONTROL LEVERS	___	___	___	___
10) LIFTING HANDLE	___	___	___	___
11) RAIL SWEEPS	___	___	___	___
12) LOCK PINS AND/OR CYLINDER DRIFT LOCK(S)	___	___	___	___

VEHICLE CHECKLIST	N/A	PASS	FAIL	REPAIRED
13) TRAVEL LIGHTS F/R	___	___	___	___
14) STOP / TAIL LIGHTS F/R	___	___	___	___
15) HEADLIGHTS F/R	___	___	___	___
16) STROBE LIGHT(S) 360^	___	___	___	___
17) BACKUP ALARM	___	___	___	___
18) REVERSE LIGHTS	___	___	___	___
19) HORN(S)	___	___	___	___
20) SUSPENSION PARTS	___	___	___	___
21) TIRES/AIR PRESSURE	___	___	___	___
22) BOOM LOCK / CRADLE	___	___	___	___
23) TOW TAB(S)	___	___	___	___
24) RAIL CLAMPS	___	___	___	___
25) LEAKS	___	___	___	___

VEHICLE CHECKLIST	N/A	PASS	FAIL	REPAIRED
26) FIRST AID KIT	___	___	___	___
27) FLAGGING KIT	___	___	___	___
28) FIRE EXTINGUISHER: WITHIN INSPECTION DATE	___	___	___	___
29) 3RD RAIL CLEARANCE:	___	___	___	___
30) SELF GUARDED FROG CLEARANCE: MIN 2-3/4"	___	___	___	___
31) OUTRIGGER TO 3RD RAIL CLEARANCE	___	___	___	___
32) OVERALL HEIGHT: MAX ON HYRAIL: 14FT. 10IN.	Ft. ___		In. ___	
33) OVERALL WIDTH: MAX: 10FT. 6IN.	Ft. ___		In. ___	

PASSED INSPECTION: _____ **FAILED INSPECTION: _____** **DEFICIENCES CORRECTED:_____**

COMMENTS: _____

_____

_____

RESTRICTIONS:_____

*** This equipment complies with Metro North's standards as noted in above referenced items only, and clearance measurements are for travel to and from work location. The use of this equipment by Contractors, State Inspectors, or Metro North employees must follow all Metro North regulations and procedures unless other written procedures have been approved by Metro North.**

INSPECTED BY:_____ EMP#_____ DATE: _____

CONTRACTOR/ OPERATOR:_____ DATE: _____

INSPECTION REPORT REVIEWED BY:_____ EMP#_____ DATE: _____

COPIES: ORIGINAL- NWP SHOP, COPY- CONTRACTOR, COPY- PROJECT MANAGER APPROVAL/STICKER # : _____

SECTION 01 11 01
CONTRACTOR REQUIREMENTS FOR WORK AFFECTING THE RAILROAD

METRO-NORTH RR AND CONTRACTORS HI-RAIL INSPECTION and VEHICLE/EQUIPMENT REQUIREMENTS 8/4/2017

PRIOR TO SCHEDULING AN INSPECTION, ALL CONTRACTORS SHALL PERFORM A **PRE-INSPECTION** ON THEIR VEHICLE/EQUIPMENT. FAILURES WILL RESULT IN RE-SCHEDULING AT THE NEXT AVAILABLE OPENING.

THE FOLLOWING SHALL BE ADHERED TO:

A copy of the HI-rail Manufacturer's specifications Front and Rear, including model numbers, guide wheel gage measurement, guide wheel and flange specifications and guide wheel load shall be provided. FRA quote: The employer shall use the manufacturer's specifications that will insure the hi-rail can be operated in a safe manner. If there are no criteria provided to measure the tram (alignment), wheel wear, and gage on a hi-rail vehicle, then the inspection would not be in compliance with this section.

1) The guide wheel gage shall be to manufacturer's specifications.
2) Tram measurement (Diagonal measurement from center of front left guide wheel to center of rear right guide wheel vs. diagonal measurement from center of front right guide wheel to center of rear left guide wheel) **shall not exceed ¼ inch.**
3) Guide Wheel Load shall be within manufacturer's specifications.
4) Wheel bearings and wheel seals shall be in satisfactory condition and greased.
5) Guide wheel and flanges shall be within manufacturer's specifications.
6) Rail brake components (brake shoes and rigging) shall be complete and in working order.
7) Steering lock shall be installed to prevent steering from turning.
8) Hydraulic cylinders and pump shall be in working order.
9) Hydraulic hoses and fittings shall be in satisfactory condition and no leaks.
10) Control levers shall be installed and in satisfactory condition.
11) Lifting handle for manual hi-rails shall be on board if applicable.
12) Rail sweeps when provided by manufacturer, shall be in working order.
13) Lock pins or acceptable means of preventing hi-rail cylinders from drifting shall be installed.
14) All lights, (Headlights, brake lights, travel lights, turn signals, marking lights, backup lights, work lights, flashers, strobe lights with 360° visibility), shall be operational. When operating on rails, with the vehicle/machine in the forward travel position, the headlights, travel and brake lights shall operate as normal. When traveling on rails in the reverse position, additional headlights, travel and brake lights shall be installed in the opposite orientation. Lighting circuit operation shall be such that when traveling forward on rails, only the front headlights and rear travel/brake lights are operational. When traveling in reverse on rails, only the rear headlights and front travel/brake lights operate.
15) All horns, change of direction and backup alarms shall be operational.
16) Suspension components shall be in satisfactory condition.
17) Tires shall be in satisfactory condition and air pressure checked. (Tire pressure affects traction and braking on hi-rail).
18) Booms and rotating upper structures shall have a boom cradle and/or pivot lock.
19) Tow tab(s) with a 1-3/16 inch hole and secure tethered pin shall be installed front and/or rear at approximately 14 in. above rail when on hi-rail.
20) Rail clamps shall be installed when working from the side of a vehicle/machine, (i.e. lifting booms, rotary dumps, etc.) Exemptions for equipment with counterweights, suspension locks and manufactures approval shall be granted.
21) There shall be no fluid leaks.
22) 3rd rail clearance: Vehicle\equipment and components (i.e. steps, brackets, tool boxes), shall not extend beyond **24 inches measured from the inside of ball of rail, at a height below 10-7/8 inches, measured from the top of rail. (See 3rd rail clearance diagram).**
23) A First Aid kit and Fire Extinguisher with a current inspection date shall be readily accessible.
24) Flagging kit shall be readily accessible including- 2 safety flags (18"x18" red flag with 18" long handle), 2 flashlights with magnets (2-D size batteries installed, 4 extra D size alkaline batteries (Ray-O-Vac or equivalent), 12 (15 minute) safety flares.
25) Clearance for self-guarded frogs shall be a minimum of **2-3/4 inches** above rail on all under carriage components.
26) Outriggers shall clear 3rd rail, electrical boxes, platforms, switch controls, etc. and secured to prevent drifting.
27) Max height shall not exceed **14ft.10in.** while traveling on rails in accordance with Metro North Park Ave Tunnel diagram.
28) Max width shall not exceed **10 ft. 6in.** while traveling on rails in accordance with Metro North Park Ave Tunnel diagram.
29) All components that are capable of drifting, swinging, opening, etc. (i.e. booms, jibs, outriggers, tool box doors, engine covers, etc.) shall be secured appropriately before traveling on rails.
30) Vehicles shall meet on track testing requirements up to and including 22 degree of curvature. **All** rubber traction tires must maintain continuous contact with the ball of the rail throughout the duration of testing curve negotiation.

Final approval of items not covered on this list that may be considered questionable, unsafe or cause any danger, shall be at the inspector's discretion . Please reference attached **49CFR214.503** to **.533** for rules as they apply to Roadway Maintenance Machines (RMM's) and Hi-rail Vehicles. ***Please be aware that the above mentioned adherences may exceed 49CFR214.503 to .533 as dictated by Metro North Railroad. METRO NORTH RESTRICTS TRAVEL THRU SELF GUARDED FROGS and SWITHCH POINT GUARDS AT NO MORE THAN 1 MPH.**

B. Metro-North Contractor Daily Hi-Rail Inspection form:

Metro-North Railroad

CONTRACTOR DAILY HI-RAIL VEHICLE INSPECTION

Project Name:	✓= Satisfactory R =Unsatisfactory, Repairs Needed X=Not Applicable
Contractor/ Company Name:	Vehicle's Hi-Rail Gear to be Locked and Railed During Inspection
Truck/ Vehicle No.:	
MNR MOW Vehicle Inspection Date: / Exp. Date	
Date of Inspection Month : Year:	

Operator

I have performed the daily inspection for this vehicle and noted no defects. Any Corrective Action made were to ensure the vehicle is in safe operating condition. Page 2 of 2 List Corrective Actions

Day	Print Name of Driver/Operator	Contractor RW I.D. No.:	Operator Qualifications (CDL & Operator Training)	Brake Test, Hand Brk Test, Pkg Break Test	Steering Mech. (Locked)	Lighting System(s)	Tire Pressure, Wheels & Rims	Vehicle Loading (check if over/under loaded)	Hydraulic Hoses & Equipment	Fuel, Oil & Coolant	Coupling Device	Horn, Mirrors, wipers	O & M Manual for Vehicle & Hi-Rail Gear	Crane, Aerial Device etc.	Hi-Rail Gear: Front & Rear : Secured & Locked	Rail Clamps (used for off loading/side dumping)	Method of Communication in Place	Seat Belts and designated seating for others	Emergency Equipment: Fire Extinguisher, Eye Wash, First Aid kit, Spill Kit
1																			
2																			
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29																			
30																			
31																			

✓ = Satisfactory R =Unsatisfactory, Repairs Needed X=Not Applicable

NOTES:

1. This Form is to Stay with this Vehicle While on MNR Property.
2. Pre Inspect Vehicle of Non Hy-Rail Gear Prior to Getting on Rails
3. Vehicle Inspection to be Completed Daily by the Vehicle Operator .
4. Operator is to notify Supervisor and/or Project Personnel of any Defects which may effect safe operation of the vehicle.
5. Provide Comments and Additional Information on Page 2 of 2
6. Provide Haz. Mat'l Placard and Shipping Papers as Needed.

Metro-North Railroad

CONTRACTOR DAILY HI-RAIL VEHICLE INSPECTION

Provide Information on Corrective Actions and/or Additional Comments From Daily Inspection	
DATE:	
DATE:	
DATE:	
DATE:	
DATE:	
DATE:	
DATE:	
DATE:	
DATE:	

Periodic Maintenance & Record of Repairs		
Date	Mileage	Description of Repairs

Contractor's Supervisor Acknowledgement of Inspection: _____ Date: _____

C. Metro-North Railroad Quarterly Contractors Push Cart Inspection form:

METRO NORTH RAILROAD QUARTERLY CONTRACTORS PUSH CART INSPECTION

PROJECT MANAGER WORK ORDER # ____ ____ ____ ____ ____ MNR WO# ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

PUSH CART SERIAL #:_____ PUSH CART UNIT #_____ Date:_____

CONTRACTOR NAME:_____ PUSH CART MANUFACTURER: _____

LOCATION:_____ LAST DATE INSPECTED: _____

MNR PROJECT MANAGER:_____ PHONE:_____ EMAIL:_____ FAX: _____

PUSH CART INFORMATION & MEASUREMENTS		
WEIGHTS	**GUIDE WHEEL GUAGE (INCHES)**	**TRAM (INCHES) / MUST BE WITHIN 1/4"**
TARE WEIGHT: _____	MANUFACTURERS SPECS / ACTUAL MEASUREMENT	LEFT FRONT TO RIGHT REAR: _____
GROSS WEIGHT : _____	FRONT:_____ _____	RIGHT FRONT TO LEFT REAR: _____
	REAR:_____ _____	DIFFERENCE: _____

PUSH CART CHECKLIST	PASS	FAIL	N/A
1) WHEEL BRGS & SEALS	___	___	
2) RAIL WHEELS	___	___	
3) RAIL WHEEL FLANGES	___	___	
4) RAIL BRAKES & RIGGING	___	___	___
5) HYD. CYLINDERS & PUMP	___	___	___
6) HYD/ AIR HOSES & FITTINGS	___	___	___
7) TIE DOWN POINTS	___	___	___
8) LEAKS	___	___	___
9) PARKING/ EMERGENCY BRAKE OPERATION	___	___	___

PUSH CART CHECKLIST	PASS	FAIL	N/A
10) PIVOT/ROTATION LOCK	___	___	___
11) BOOM LOCK / CRADLE	___	___	___
12) TOW TAB(S)	___	___	
13) RAIL CLAMPS	___	___	___
14) LOCK PINS AND/OR CYLINDER DRIFT LOCKS	___	___	___
15) 1" WEIGHT MARKINGS	___	___	
16) 1" LENGTH MARKINGS	___	___	
17) 1" WIDTH MARKINGS	___	___	
18) TOW BAR SAFETY CHAIN	___	___	___

PUSH CART CHECKLIST	PASS	FAIL	N/A
19) PUSH CART MANUAL PRESENT IN VEHICLE	___	___	
20) 3RD RAIL CLEARANCE:	___	___	
21) SELF GUARDED FROG CLEARANCE: MIN 2-3/4"	___	___	
22) OUTRIGGER TO 3RD RAIL CLEARANCE	___	___	
23) OVERALL HEIGHT: MAX ON RAIL: 14FT. 10IN.	___	___	
HEIGHT- _____			
24) OVERALL WIDTH: MAX ON RAIL: 10FT. 6IN.	___	___	
WIDTH- _____			

PASSED INSPECTION: _____ **FAILED INSPECTION**: _____

COMMENTS: _____

_____

_____

* This equipment complies with Metro North's standards as noted in above referenced items only, and clearance measurements are for travel to and from work location. The use of this equipment by Contractors, State Inspectors, or Metro North employees must follow all Metro North regulations and procedures unless other written procedures have been approved by Metro North.

INSPECTED BY:_____ MAN#_____ DATE: _____

INSPECTION REPORT REVIEWED BY:_____ MAN#_____ DATE: _____

CONTRACTOR/ OPERATOR:_____ DATE: _____

COPIES: ORIGINAL- NWP SHOP, COPY- CONTRACTOR, COPY- PROJECT MANAGER INSPECTION STICKER # : _____

PUSH CART INSPECTION FORM-CONTRACTORS 8-10-18

METRO-NORTH RR AND CONTRACTORS PUSH CART INSPECTION 8/10/2018

PRIOR TO SCHEDULING AN INSPECTION, ALL CONTRACTORS SHALL PERFORM A **PRE-INSPECTION** ON THEIR PUSH CART/EQUIPMENT. FAILURES WILL RESULT IN RE-SCHEDULING AT THE NEXT AVAILABLE OPENING.

THE FOLLOWING SHALL BE ADHERED TO:

A copy of the rail cart manufacturer's specifications, including model numbers, guide wheel gage measurement, guide wheel and flange specifications, tram measurements, engineered drawings and manufactured weight capacities must be provided. If there is no criteria provided to measure the tram (alignment), wheel flange wear, and gage on a push cart, a Metro-North inspection will not be able to be performed.

1) A declaration of intended use, listing all equipment/cargo that is to be transported, must be supplied at time of inspection.
2) The guide wheel gage shall be to manufacturer's specifications.
3) Tram measurement (Diagonal measurement from center of front left guide wheel to center of rear right guide wheel vs. diagonal measurement from center of front right guide wheel to center of rear left guide wheel) **shall not exceed ¼ inch.**
4) Wheel bearings and wheel seals shall be in satisfactory condition and greased.
5) Guide wheel and flanges shall be within manufacturer's specifications and be of A.A.R profile.
6) Carts must have at least 1" tall lettering to identify carts maximum length, width, tare weight and gross weight.
7) All carts must have parking / emergency brakes that deploy with a lack of energy source (i.e. hydraulic / pneumatic pressure).
8) All carts with a rated capacity of 5,000 lbs. and above shall have service brakes with connections on both ends of the cart.
9) All carts with a rated capacity of 5,000 lbs. and under shall have a secondary means of securement to the tow vehicle in addition to the tow bar. (i.e. safety chain with spring loaded safety hasps).
10) Rail brake components (brake shoes and rigging) shall be complete and in working order.
11) Hydraulic hoses and fittings shall be in satisfactory condition and exhibit no leaks.
12) Any equipment loaded on cart that has a boom and/or rotating upper structure must have boom cradle and/or pivot lock.
13) Rail clamps shall be installed when working from the side of a cart with machinery (i.e. lifting booms, excavators, etc.).
14) Tow tab(s) with a 1-3/16 inch hole and secure tethered pin shall be installed front and/or rear at approximately 14 in. above rail when on hi-rail. If pintle receiver is used a toe tab adaptor plate must be supplied.
15) There shall be no fluid leaks.
16) 3rd rail clearance: Cart and components (i.e. machinery, steps, brackets, tool boxes), shall not extend beyond **24 inches measured from the inside of ball of rail, at a height below 10-7/8 inches, measured from the top of rail. (See 3rd rail**
17) Cart and components (i.e. machinery, steps, brackets, tool boxes), shall not extend beyond the Metro North Park Ave Tunnel
18) Cart and components (i.e. machinery, steps, brackets, tool boxes), shall not extend beyond the Metro North Minimum
19) Clearance for self-guarded frogs shall be a minimum of **2-3/4 inches** above rail on all under carriage components.
20) All components of the cart and any loaded cargo must clear the 3rd rail, electrical boxes, platforms, switch controls, etc. and be secured to prevent drifting.
21) All components that are capable of drifting, swinging, opening, etc. (i.e. booms, jibs, outriggers, tool box doors, engine covers, etc.) shall be secured appropriately before traveling on rails.
22) Clearance for self-guarded frogs shall be a minimum of **2-3/4 inches** above rail on all under carriage components.
23) All components of the cart and any loaded cargo must clear the 3rd rail, electrical boxes, platforms, switch controls, etc. and secured to prevent drifting.
24) Cart shall meet on track testing requirements up to and including 22 degree of curvature.

Final approval of items not covered on this list that may be considered questionable, unsafe or cause any danger, shall be at the inspector's discretion . **METRO NORTH RESTRICTS TRAVEL THRU SELF GUARDED FROGS and SWITHCH POINT GUARDS AT NO MORE THAN 1 MPH.**

Push Cart Declaration of Intended Use

Contractor name- _____

Metro North Project Manager _____

Metro North project location _____

Cart I.D. #- _____

Tare weight-_____

Gross weight-_____

Contents to be carried-_____

_____

_____

_____

_____

2.03 WORK PLAN

A. Metro-North Work Plan Sample:

The following outline and template is presented as an aid to assist Contractors in preparing their Work Plans. This template shall be completed by the Contractor and submitted as a Work Plan. Any deviations from the Work Plan must be approved in writing, by the Engineer prior to the date that the work has been scheduled.

Contract Number / Project Name	**10000XXXXX New Haven Line Power Improvements**		
General Contractor	**Generic Electric**		
Subcontractor	**N/A**		
Submittal #	**011101-008.1**		
Submittal Name	**Wire Pulls for Catenary 58**		
Safe Work Plan #	**Plan # 21 - Approved**	**SWP Submittal #**	**013360-010.1A**

(Check One)	☐Initial Submittal ☒Revised Submittal	Revision Number Revision Date	001 02/01/2016

Work Plan Details		
A. **Corresponding Submittal Numbers and Status**		
1. Rigging Plan	N/A	N/A
2. Scaffolding Plan	N/A	N/A
3. Shoring Plan	N/A	N/A
4. Fall Protection Plan	N/A	N/A
B. **Description of Work**		
Pull wires from the basement of Substation 61 to Catenary 58.		
C. **Outages**		

Track	Power
Task 1: Foul Time Hell Gate 1&2 to cross workers and equip.	N/A
Task 2: Shifts 1&2 Tracks 2&4. Shifts 3&4 Tracks 1&3.	Shifts 1&2 South Side power and Tracks 2&4. Shifts 3&4 North Side power and Tracks 3&1.
Task 3: Foul Time Hell Gate 1&2 to cross workers and equip.	Outage within Substation 61 to access basement area for wire pulls.

Work Plan Details	
D. **Labor**	
Task 1: Foreman, 2 Electricians, 2 Laborers	
Task 2: Crew 1: Foreman and Lineman. Crew 2: 2 Electricians and 3 Laborers	
Task 3: Foreman, Lineman, 2 Electricians and 3 Laborers	
E. **Equipment**	
Task 1: Greenlee cable tugger, Cable reel truck and hand tools.	
Task 2: Rental HY-Rail articulating boom bucket truck, Greenlee cable tugger and hand tools.	
Task 3: Greenlee cable tugger, Cable reel truck and hand tools.	
F. **Time Requirements**	
Task 1: Shift time 7:00AM to 3:00PM. It is anticipated that it will take approximately 4 hours to set up and pull each of the four wires.	
Task 2: Shift time 10:00PM to 5:00AM. It is anticipated that it will take approximately 4 hours to set up and pull each of the four wires.	
Task 3: Shift time 10:00PM to 5:00AM. It is anticipated that it will take approximately 4 hours to set up and pull each of the four wires.	
G. **Site Access**	
Task 1: Access east of Webster Avenue, EMH-01 area, through substation 61 yard. Crossing of Hell Gate Tracks 1&2 required. Access west of Webster Avenue, EMH-01 area, via city of New Rochelle leaf dump on Beechwood Avenue.	
Task 2: Crew 1 will access the Tower 58 area via HY-Rail pads at Pelham station and proceed north to the site once track outage is granted. Crew 2 will access the Tower 58 area via the city of New Rochelle leaf dump on Beechwood Avenue at shift start time.	
Task 3: Access to the site via the substation 61 yard. Requires crossing of Hell Gate Tracks 1&2.	
H. **Breakdown of Work**	
Task 1: Pull four segments of wire on the wayside from EMH-01 through previously installed concrete duct bank to EMH-02. These segments of wire will also include necessary “slack” for pulls from EMH-02 to termination points on tower 58. Each wire pull will be completed once started and the manhole covers will be returned at the end of each shift.	
Task 2: Pull four segments of wire from EMH-02 on the wayside through previously installed concrete duct bank and previously installed RGS conduits to termination points on Tower 58. The wire pulls must be completed once started, manhole cover returned and wire securely fastened to termination points for future connections by others.	
Task 3: Pull four segments of wire from EMH-01 through previously installed concrete duct bank into the basement of substation 61. Each wire pull must be completed once started and manhole cover for EMH-01 will be returned at the end of each shift.	

Work Plan Details
Additional Comments and Attachments:
1.
2.
3.
4.

Prepared By:

Printed Name: _____ **Signature:** _____ **Date:** _____

Checked By:

Printed Name: _____ **Signature:** _____ **Date:** _____

2.04 ERECTION DEMOLITON OR OTHER RIGGING

A. Metro-North Railroad Crane Plan Checklist:

The following outline and checklist is presented as an aid to assist Contractors in preparing their Crane Erection Plans. This checklist shall be completed by the Contractor and submitted with the Crane Erection Plan. Failure of the Contractor to complete this checklist and submit it along with the Crane Erection Plan shall be grounds for rejection of the submittal. Any deviations from the Crane Erection Plan must be approved in writing, by the Engineer prior to the date that the work has been scheduled.

Contract Number / Project Name			
General Contractor			
Erecting Contractor			
Submittal #			
Operational Objective:			
Crane Model/Type (All Terrain/Tires)		**Maximum Capacity**	
Critical Pick - Independent Reviewer Required	**Yes / No**		

(Check One)	☐Initial Submittal ☐Revised Submittal	Revision Number Revision Date	

Operational Requirements/Restrictions

1. The lifting operation may not take place if wind speeds are 20mph or higher, or if there are anticipated wind gusts of 30mph or higher.
2. If there is rain, fog, snow, or lightning the operation may not take place.
3. When the crane is not in use, it must be stored with the boom down.

Operation Dates/Hours:	Start Date:		End Date:		Start Time:		End Time:	

General Notes

1. Rigging and lifting operations shall not commence unless the Railroad has approved the required submittals.
2. Lifting operations occurring over track shall not be performed without proper Metro-North supervision (Transportation “Flag” Protection) and necessary protection of track (i.e. Track Outages, etc.).
3. No lift shall be made over property owned by others without written permission from the property owner.

SECTION 01 11 01
CONTRACTOR REQUIREMENTS FOR WORK AFFECTING THE RAILROAD

Description	Included	Comments / Notes Identify Revised Sections- Revision Number & Date
A. Personnel Certifications, Licenses, and Qualifications		
1. All Erection Plans and Calculations must be prepared and stamped by a Professional Engineer licensed in the state in which the project is located.		
2. Qualified Rigger Certification and Resume.		
3. Identify Competent Person responsible for crane inspection, testing, rigging, and lifting operation.		
B. Narrative		
1. Provide a Narrative Describing:		
a) The intent of the operation.		
b) The hazards associated with the operation (i.e. proximity to the tracks, buildings, underground infrastructure).		
2. Provide a timeline for the operation indicating the order of lifts and repositioning or re-hitching if applicable.		
C. Calculations		
1. Provide calculations for the following items:		
a) Weight of various items to be lifted including a 150% safety factor.		
b) Crane capacity of various items, (include crane block and rigging) at defined radius and boom length.		
c) Tensions in Rigging Components: Slings, Shackles and Rigging assembly.		
d) Maximum Outrigger Load, Unloaded Condition, and Outrigger Dunnage Design.		
i. Include load transferred to soil, soil bearing capacity, lateral earth pressure distribution and mat details.		
e) Dunnage Mat Details including calculations of shear and bending moment of mat. (Actual timber dimensions shall be used for dunnage mat calculations.)		
D. Drawings		
1. Provide drawings of the following:		
a) Scaled Plan View of the site including:		
i. Crane location showing center pin, outriggers/dunnage mats, and tail swing.		
ii. Radius of all picks.		

Description	Included	Comments / Notes Identify Revised Sections- Revision Number & Date
iii. Delivery, setting, and disposal locations.		
iv. Underground and overhead utilities/structures.		
b) Profile View of Load Rigged including, the block, slings (configuration and geometry), shackles, spreader bar and any other hardware components which make up the rigging assembly.		
c) Cross-section View of obstructions proving that proposed swing is possible.		
2. Provide details of Special Dunnage, Cribbing, or other Protection, which will be utilized.		
E. Cut Sheets		
1. Provide cut sheets for the following:		
a) Slings, Shackles, and all Rigging Components.		
b) Crane, including dimensions, outrigger configurations, and lifting charts.		
F. Other Supporting Documentation		
1. Provide protection for all surface and subsurface structures and utilities.		
2. Maintenance and Protection of Traffic Plan.		
3. Provide DOT Road Permits for Crane Travel.		
4. Provide Street Closure Permit.		
G. Field Work Requirements (Verify In Field)		
1. Crane Center Pin and Outriggers must be spray painted in the field at least 48 hours prior to operation.		
2. Verify Radii and Clearance for Critical Picks.		
3. Confirm the stability of the foundation for crane outrigger loads.		
4. Confirm there are no underground utilities or structures (Call Before You Dig and Metro-North Utility Locate Protocol).		
5. Confirmation that Engineer visited the site.		
6. Engineer to be present during operation.	Yes / No	
H. Crane Check List		

SECTION 01 11 01
CONTRACTOR REQUIREMENTS FOR WORK AFFECTING THE RAILROAD

Description	Included	Comments / Notes Identify Revised Sections- Revision Number & Date
1. Certificate of Crane Inspection and written statement from the crane owner indicating the date of the last inspection.		
2. Copy of Crane Maintenance Records.		
3. Crane Operators License.		

Additional Comments:
1.
2.
3.
4.

Metro-North Reviewed By:

Printed Name: _____ **Signature:** _____ **Date:** _____

Metro-North Checked By:

Printed Name: _____ **Signature:** _____ **Date:** _____

2.05 SHEETING AND SHORING

A. Metro-North Railroad Sheeting and Shoring Plan Checklist:

The following outline and checklist is presented as an aid to assist Contractors in preparing their Sheeting and Shoring Plans. This checklist shall be completed by the Contractor and submitted with the Sheeting and Shoring Plan. Failure of the Contractor to complete this checklist and submit it along with the Sheeting and Shoring Plan shall be grounds for rejection of the submittal. Any deviations from the Sheeting and Shoring Plan must be approved in writing, by the Engineer prior to the date that the work has been scheduled.

Contract Number / Project Name	
General Contractor	
Installing Contractor	
Submittal #	

(Check One)	☐ Initial Submittal ☐ Revised Submittal	Revision Number Revision Date	

Description	Included	Comments / Notes Identify Revised Sections- Revision Number & Date
A. General Notes		
1. Railroad Live Load Influence Line: Sheeting shall be required on all excavations where the side of the excavation is intercepted by the Railroad Live Load Influence Line. The Live Load Influence Line is defined as a line originating at the bottom outside edge of tie and extending downward at a slope of 1 vertical to 1.5 horizontal.		
2. Theoretical Railroad Embankment Line: Maintain Lateral Support of the track system. Lateral support shall consist of a compacted stone ballast shoulder level with the top of tie for at least one foot outside the end of tie supported by a slope no steeper than one (1) vertical to two (2) horizontal.		
3. Plans and Calculations must be prepared and stamped by a Professional Engineer licensed in the state in which the project is located.		
B. Material Requirements		
1. If Timber Sheeting is utilized the wood must be treated with wood preservatives in accordance with the American Wood Preservers Association standards for timber in contact with soil.		
C. Drawings		
1. Plan View (including Clearance to Track Center Line).		
2. Elevation View showing the Track Influence Line and Railroad Embankment Line.		

D. Calculations		
1. Static Loads.		
2. Structural Dead Load.		
3. Soil Pressure Loads.		
4. Hydrostatic Pressure Loads.		
5. Railroad Live Load of Cooper E-80.		
6. Other Loading Magnitude as may be directed by the Engineer.		

Additional Comments:
1.
2.
3.
4.

Prepared By:

Printed Name: _____ **Signature:** _____ **Date:** _____

2.06 SCAFFOLDING

A. Metro-North Railroad Scaffolding Plan Checklist:

The following outline and checklist is presented as an aid to assist Contractors in preparing their Scaffolding Erection Plans. This checklist shall be completed by the Contractor and submitted with the Scaffolding Erection Plan. Failure of the Contractor to complete this checklist and submit it along with the Scaffolding Erection Plan shall be grounds for rejection of the submittal. Any deviations from the Scaffolding Erection Plan must be approved in writing, by the Engineer prior to the date that the work has been scheduled.

Contract Number / Project Name	
General Contractor	
Erecting Contractor	
Submittal #	

(Check One)	☐ Initial Submittal ☐ Revised Submittal	Revision Number Revision Date	

Description	Included	Comments / Notes Identify Revised Sections- Revision Number & Date
A. General Notes		
1. Wood must conform to ASTM E-84 Fire Retardant specification for exterior application 30 minute duration.		
2. Plans and Calculations must be prepared and stamped by a Professional Engineer licensed in the state in which the project is located.		
B. Scaffolding Design Requirements for Containing Finely Broken Concrete Decking		
1. Calculations		
a. Live Load of 200 lbs. per square foot applied uniformly over the entire structure*		
b. 2 kip concentrated load*		
*The two loads are not to be applied simultaneously for design purposes.		
2. Drawings		
a. Plan View (include Clearance to Track Center Line).		
b. Elevation View.		
3. Cut Sheets		
a. Scaffolding legs and cross bracing.		

Description	Included	Comments / Notes Identify Revised Sections- Revision Number & Date
b. All Hardware Components.		

Additional Comments:
1.
2.
3.
4.

Prepared By:

Printed Name: _____ **Signature:** _____ **Date:** _____

2.07 ENGINEERED FALL PROTECTION PLAN

A. Metro-North Engineered Fall Protection Plan Checklist:

The following outline and checklist is presented as an aid to assist Contractors in preparing their Engineered Fall Protection Plans. This checklist shall be completed by the Contractor and submitted with the Engineered Fall Protection Plan. Failure of the Contractor to complete this checklist and submit it along with the Engineered Fall Protection Plan shall be grounds for rejection of the submittal. This checklist is not for preparation of the Contractor's site specific Fall Protection Plan as required for the Safety, Health & Environmental Control Plan. Any deviations from the Engineered Fall Protection Plan must be approved in writing, by the Engineer prior to the date that the work has been scheduled.

Contract Number / Project Name	
General Contractor	
Erecting Contractor	
Submittal #	

(Check One)	☐ Initial Submittal ☐ Revised Submittal	Revision Number Revision Date	

Description	Included	Comments / Notes Identify Revised Sections- Revision Number & Date
A. General Notes		
1. Plans and Calculations must be prepared and stamped by a Professional Engineer licensed in the state in which the project is located.		
B. Fall Protection Design Requirements		
1. Calculations		
a. Horizontal life lines designed to a factor of safety of two.		
b. Vertical life lines minimum breaking strength of 5000 lbs. per person.		
c. Anchorage point design to meet OSHA guidelines.		
d. Fall clearance.		
2. Drawings		
a. Plan View.		
b. Elevation View.		
c. Anchorage Point Details.		

Description	Included	Comments / Notes Identify Revised Sections- Revision Number & Date
3. Cut Sheets		
a. All Hardware Components.		

Additional Comments:
1.
2.
3.
4.

Prepared By:

Printed Name: _____ **Signature:** _____ **Date:** _____

PART 3 EXECUTION

NOT USED

END OF SECTION

Metro-North Railroad
Contractor Hi-Rail Vehicle and Push Carts
General Information Required

Contractor Information Needed for Hi-Rail Vehicles and Push Carts:

1. **Construction Management to require a Safe Work Plan (SWP) submittal for Hi-rail equipment, to include (and not be limited to)**:

    a. Contractor supplying Hi-Rail Gear and compatibility with equipment.

    b. A copy of MFR's Spec for both the Hi-Rail Gear and Equipment

    c. Operations & Maintenance Manual for Hi-Rail Gear and Vehicle (or verification the Manual will be kept with the equipment).

    d. Operator to conduct 'Daily Inspection' of Hi-Rail Vehicle & use MNR's Daily Inspection form (as provided in the specification).

    e. Hi-Rail Gear to be greased regularly (or before use)

    f. Contractor to provide a List of Qualified Operators for the project.

    g. **Contractor to identify in submittal tentative routes the vehicle will travel** (identify if equipment will be used in GCT vs ROW; track locations; access to tracks; tracks no.'s; interlocking; switches - to the best of their knowledge with assistance from the CM)

    h. Contractor will identify lay over locations on and off track (changes to be noted on Daily inspection form; CM is to be given copies of inspections monthly).

    i. Contractor to Identify a Mechanic they will use and be available for maintenance if needed.

2. **Construction Management to request a Safe Work Plan Submittal for Operator Qualifications and proficiency- Information to include:**

    a. CDL (commercial Driver's License)

    b. Provide Operators previous experience with Hi-Rail equipment/gear (list railroad, date and type of equipment used).

    c. Document Operators training and/or instruction given by a 'House Mechanic' if owned, or by rental Equipment Vendor Mechanic.

    d. **OPERATION IN GCT:** MNR Pilot (is to work with Contractor's Operator) and WALK Hi-Rail equipment through switches, interlocking & Frogs and any other type or potential situation that could cause equipment derailment.

3. **Copy of MNR MOW Hi-Rail inspection Form to be given to MNR CM.**
4. **Copies of Daily Inspection forms (to be part of the Monthly Submittal Package)**
5. **Push Cart Declaration of Intended Use (If Applicable)**

METRO NORTH RAILROAD QUARTERLY
CONTRACTORS VEHICLE/MACHINE AND HI-RAIL GEAR INSPECTION

PROJECT MANAGER WORK ORDER # _____ _____ _____ _____ _____ MNR WO# _____

Last 8 of VIN #: _____ VEHICLE UNIT # _____ Date: _____

MACHINE TYPE: _____ VEHICLE MAKE/MODEL: _____

CONTRACTOR NAME: _____ HI-RAIL MANUFACTURER: _____

LOCATION: _____ LAST DATE INSPECTED: _____

MNR PROJECT MANAGER: _____ PHONE: _____ EMAIL: _____ FAX: _____

HI-RAIL GEAR INFORMATION & MEASUREMENTS

MODEL#	GUIDE WHEEL GUAGE (INCHES)		TRAM (INCHES) / MUST BE WITHIN 1/4"
	MANUFACTURERS SPECS	ACTUAL MEASUREMENT	LEFT FRONT TO RIGHT REAR:
FRONT:			RIGHT FRONT TO LEFT REAR:
REAR:			DIFFERENCE:

HI-RAIL CHECKLIST	PASS	FAIL	N/A
1) WHEEL BRGS & SEALS			
2) RAIL WHEELS			
3) RAIL WHEEL FLANGES			
4) RAIL BRAKES & RIGGING			
5) GUIDE WHEEL LOAD			
6) STEERING LOCK			
7) HYD. CYLINDERS & PUMP			
8) HYD HOSES & FITTINGS			
9) CONTROL LEVERS			
10) LIFTING HANDLE			
11) RAIL SWEEPS			
12) LOCK PINS AND/OR CYLINDER DRIFT LOCK(S)			

VEHICLE CHECKLIST	PASS	FAIL	N/A
13) TRAVEL LIGHTS F/R			
14) STOP / TAIL LIGHTS F/R			
15) HEADLIGHTS F/R			
16) STROBE LIGHT(S) 360°			
17) BACKUP ALARM			
18) REVERSE LIGHTS			
19) HORN(S)			
20) SUSPENSION PARTS			
21) TIRES/AIR PRESSURE			
22) BOOM LOCK / CRADLE			
23) TOW TAB(S)			
24) RAIL CLAMPS			
25) LEAKS			

VEHICLE CHECKLIST	PASS	FAIL	N/A
HI-RAIL MANUAL 26) PRESENT IN VEHICLE			
27) FIRST AID KIT			
28) FLAGGING KIT			
29) FIRE EXTINGUISHER: WITHIN INSPECTION DATE			
30) 3RD RAIL CLEARANCE:			
31) SELF GUARDED FROG CLEARANCE: MIN 2-3/4"			
32) OUTRIGGER TO 3RD RAIL CLEARANCE			
33) OVERALL HEIGHT: MAX ON HYRAIL: 14FT. 10IN.			
34) OVERALL WIDTH: MAX: 10FT. 6IN.			

PASSED INSPECTION: _____ **FAILED INSPECTION:** _____

COMMENTS: _____

_____

_____

RESTRICTIONS: _____

* This equipment complies with Metro North's standards as noted in above referenced items only, and clearance measurements are for travel to and from work location. The use of this equipment by Contractors, State Inspectors, or Metro North employees must follow all Metro North regulations and procedures unless other written procedures have been approved by Metro North.

INSPECTED BY: _____ MAN# _____ DATE: _____

INSPECTION REPORT REVIEWED BY: _____ MAN# _____ DATE: _____

CONTRACTOR/ OPERATOR: _____ DATE: _____

COPIES: ORIGINAL- NWP SHOP, COPY- CONTRACTOR, COPY- PROJECT MANAGER

INSPECTION STICKER # : _____

METRO-NORTH RR AND CONTRACTORS HI-RAIL INSPECTION and VEHICLE/EQUIPMENT REQUIREMENTS 8/4/2017

PRIOR TO SCHEDULING AN INSPECTION, ALL CONTRACTORS SHALL PERFORM A **PRE-INSPECTION** ON THEIR VEHICLE/EQUIPMENT. FAILURES WILL RESULT IN RE-SCHEDULING AT THE NEXT AVAILABLE OPENING.

THE FOLLOWING SHALL BE ADHERED TO:

A copy of the HI-rail Manufacturer's specifications Front and Rear, including model numbers, guide wheel gage measurement, guide wheel and flange specifications and guide wheel load shall be provided. FRA quote: The employer shall use the manufacturer's specifications that will insure the hi-rail can be operated in a safe manner. If there are no criteria provided to measure the tram (alignment), wheel wear, and gage on a hi-rail vehicle, then the inspection would not be in compliance with this section.

1) The guide wheel gage shall be to manufacturer's specifications.
2) Tram measurement (Diagonal measurement from center of front left guide wheel to center of rear right guide wheel vs. diagonal measurement from center of front right guide wheel to center of rear left guide wheel) **shall not exceed ¼ inch.**
3) Guide Wheel Load shall be within manufacturer's specifications.
4) Wheel bearings and wheel seals shall be in satisfactory condition and greased.
5) Guide wheel and flanges shall be within manufacturer's specifications.
6) Rail brake components (brake shoes and rigging) shall be complete and in working order.
7) Steering lock shall be installed to prevent steering from turning.
8) Hydraulic cylinders and pump shall be in working order.
9) Hydraulic hoses and fittings shall be in satisfactory condition and no leaks.
10) Control levers shall be installed and in satisfactory condition.
11) Lifting handle for manual hi-rails shall be on board if applicable.
12) Rail sweeps when provided by manufacturer, shall be in working order.
13) Lock pins or acceptable means of preventing hi-rail cylinders from drifting shall be installed.
14) All lights, (Headlights, brake lights, travel lights, turn signals, marking lights, backup lights, work lights, flashers, strobe lights with 360° visibility), shall be operational. When operating on rails, with the vehicle/machine in the forward travel position, the headlights, travel and brake lights shall operate as normal. When traveling on rails in the reverse position, additional headlights, travel and brake lights shall be installed in the opposite orientation. Lighting circuit operation shall be such that when traveling forward on rails, only the front headlights and rear travel/brake lights are operational. When traveling in reverse on rails, only the rear headlights and front travel/brake lights operate.
15) All horns, change of direction and backup alarms shall be operational.
16) Suspension components shall be in satisfactory condition.
17) Tires shall be in satisfactory condition and air pressure checked. (Tire pressure affects traction and braking on hi-rail).
18) Booms and rotating upper structures shall have a boom cradle and/or pivot lock.
19) Tow tab(s) with a 1-3/16 inch hole and secure tethered pin shall be installed front and/or rear at approximately 14 in. above rail when on hi-rail.
20) Rail clamps shall be installed when working from the side of a vehicle/machine, (i.e. lifting booms, rotary dumps, etc.) Exemptions for equipment with counterweights, suspension locks and manufactures approval shall be granted.
21) There shall be no fluid leaks.
22) 3rd rail clearance: Vehicle\equipment and components (i.e. steps, brackets, tool boxes), shall not extend beyond **24 inches measured from the inside of ball of rail, at a height below 10-7/8 inches, measured from the top of rail. (See 3rd rail clearance diagram).**
23) A First Aid kit and Fire Extinguisher with a current inspection date shall be readily accessible.
24) Flagging kit shall be readily accessible including- 2 safety flags (18"x18" red flag with 18" long handle), 2 flashlights with magnets (2-D size batteries installed, 4 extra D size alkaline batteries (Ray-O-Vac or equivalent), 12 (15 minute) safety flares.
25) Clearance for self-guarded frogs shall be a minimum of **2-3/4 inches** above rail on all under carriage components.
26) Outriggers shall clear 3rd rail, electrical boxes, platforms, switch controls, etc. and secured to prevent drifting.
27) Max height shall not exceed **14ft.10in.** while traveling on rails in accordance with Metro North Park Ave Tunnel diagram.
28) Max width shall not exceed **10 ft. 6in.** while traveling on rails in accordance with Metro North Park Ave Tunnel diagram.
29) All components that are capable of drifting, swinging, opening, etc. (i.e. booms, jibs, outriggers, tool box doors, engine covers, etc.) shall be secured appropriately before traveling on rails.
30) Vehicles shall meet on track testing requirements up to and including 22 degree of curvature. **All** rubber traction tires must maintain continuous contact with the ball of the rail throughout the duration of testing curve negotiation.

Final approval of items not covered on this list that may be considered questionable, unsafe or cause any danger, shall be at the inspector's discretion. Please reference attached **49CFR214.503** to **.533** for rules as they apply to Roadway Maintenance Machines (RMM's) and Hi-rail Vehicles. ***Please be aware that the above mentioned adherences may exceed 49CFR214.503 to .533 as dictated by Metro North Railroad. METRO NORTH RESTRICTS TRAVEL THRU SELF GUARDED FROGS and SWITHCH POINT GUARDS AT NO MORE THAN 1 MPH.**

Metro-North Railroad

CONTRACTOR DAILY HI-RAIL VEHICLE INSPECTION

Project Name:	
Contractor/ Company Name:	
Truck/ Vehicle No.:	
MNR MOW Vehicle Inspection Date:	**Exp. Date**
Date of Inspection Month :	**Year:**

Operator

I have performed the daily inspection for this vehicle and noted no defects. Any Corrective Action made were to ensure the vehicle is in safe operating condition. Page 2 of 2 List Corrective Actions

✓ = Satisfactory R =Unsatisfactory, Repairs Needed X=Not Applicable

Vehicle's Hi-Rail Gear to be Locked and Railed During Inspection

Day	Print Name of Driver/Operator	Contractor RW I.D. No.:	Operator Qualifications (CDL & Operator Training)	Brake Test, Hand Bk Test, Pkg Break Test	Steering Mech. (Locked)	Lighting System(s)	Tire Pressure, Wheels & Rims	Vehicle Loading (check if over/under loaded)	Hydraulic Hoses & Equipment	Fuel, Oil & Coolant	Coupling Device	Horn, Mirrors, wipers	O & M Manual for Vehicle & Hi-Rail Gear	Crane, Aerial Device etc.	Hi-Rail Gear: Front & Rear : Secured & Locked	Rail Clamps (used for off loading/side dumping)	Method of Communication in Place	Seat Belts and designated seating for others	Emergency Equipment: Fire Extinguisher, Eye Wash, First Aid kit, Spill Kit
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
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31																			

✓ = Satisfactory R =Unsatisfactory, Repairs Needed X=Not Applicable

NOTES:

1. This Form is to Stay with this Vehicle While on MNR Property.
2. Pre Inspect Vehicle of Non Hy-Rail Gear Prior to Getting on Rails
3. Vehicle Inspection to be Completed Daily by the Vehicle Operator .
4. Operator is to notify Supervisor and/or Project Personnel of any Defects which may effect safe operation of the vehicle.
5. Provide Comments and Additional Information on Page 2 of 2
6. Provide Haz. Mat'l Placard and Shipping Papers as Needed.

Metro-North Railroad

CONTRACTOR DAILY HI-RAIL VEHICLE INSPECTION

Provide Information on Corrective Actions and/or Additional Comments From Daily Inspection	
DATE:	
DATE:	
DATE:	
DATE:	
DATE:	
DATE:	
DATE:	
DATE:	
DATE:	

Periodic Maintenance & Record of Repairs		
Date	Mileage	Description of Repairs

Contractor's Supervisor Acknowledgement of Inspection: _____ **Date:** _____

METRO NORTH RAILROAD QUARTERLY
CONTRACTORS PUSH CART INSPECTION

PROJECT MANAGER WORK ORDER # _____ _____ _____ _____ _____ **MNR WO#** ____ ____ ____ ____ ____ ____ ____ ____ ____ ____ ____

PUSH CART SERIAL #:_____ **PUSH CART UNIT #**_____ **Date:**_____

CONTRACTOR NAME:_____ **PUSH CART MANUFACTURER:** _____

LOCATION:_____ **LAST DATE INSPECTED:** _____

MNR PROJECT MANAGER:_____ **PHONE:**_____ **EMAIL:**_____ **FAX:** _____

PUSH CART INFORMATION & MEASUREMENTS		
WEIGHTS	**GUIDE WHEEL GUAGE (INCHES)**	**TRAM (INCHES) / MUST BE WITHIN 1/4"**
TARE WEIGHT: _____	**MANUFACTURERS SPECS** **ACTUAL MEASUREMENT**	**LEFT FRONT TO RIGHT REAR:** _____
GROSS WEIGHT : _____	**FRONT:**_____ _____	**RIGHT FRONT TO LEFT REAR:** _____
	REAR:_____ _____	**DIFFERENCE:** _____

PUSH CART CHECKLIST				PUSH CART CHECKLIST				PUSH CART CHECKLIST			
	PASS	**FAIL**	**N/A**		**PASS**	**FAIL**	**N/A**		**PASS**	**FAIL**	**N/A**
1) **WHEEL BRGS & SEALS**	___	___		10) **PIVOT/ROTATION LOCK**	___	___	___	19) **PUSH CART MANUAL PRESENT IN VEHICLE**	___	___	
2) **RAIL WHEELS**	___	___		11) **BOOM LOCK / CRADLE**	___	___	___	20) **3RD RAIL CLEARANCE:**	___	___	
3) **RAIL WHEEL FLANGES**	___	___		12) **TOW TAB(S)**	___	___		21) **SELF GUARDED FROG CLEARANCE: MIN 2-3/4"**	___	___	
4) **RAIL BRAKES & RIGGING**	___	___	___	13) **RAIL CLAMPS**	___	___	___	22) **OUTRIGGER TO 3RD RAIL CLEARANCE**	___	___	
5) **HYD. CYLINDERS & PUMP**	___	___	___	14) **LOCK PINS AND/OR CYLINDER DRIFT LOCKS**	___	___	___				
6) **HYD/ AIR HOSES & FITTINGS**	___	___	___	15) **1" WEIGHT MARKINGS**	___	___		23) **OVERALL HEIGHT:** MAX ON RAIL: 14FT. 10IN.	___	___	
7) **TIE DOWN POINTS**	___	___	___	16) **1" LENGTH MARKINGS**	___	___		**HEIGHT-** _____			
8) **LEAKS**	___	___	___	17) **1" WIDTH MARKINGS**	___	___		24) **OVERALL WIDTH:** MAX ON RAIL: 10FT. 6IN.	___	___	
9) **PARKING/ EMERGENCY BRAKE OPERATION**	___	___	___	18) **TOW BAR SAFETY CHAIN**	___	___	___	**WIDTH-** _____			

PASSED INSPECTION: _____ **FAILED INSPECTION:** _____

COMMENTS: _____

_____

_____

*** This equipment complies with Metro North's standards as noted in above referenced items only, and clearance measurements are for travel to and from work location. The use of this equipment by Contractors, State Inspectors, or Metro North employees must follow all Metro North regulations and procedures unless other written procedures have been approved by Metro North.**

INSPECTED BY:_____ **MAN#**_____ **DATE:** _____

INSPECTION REPORT REVIEWED BY:_____ **MAN#**_____ **DATE:** _____

CONTRACTOR/ OPERATOR:_____ **DATE:** _____

COPIES: ORIGINAL- NWP SHOP, COPY- CONTRACTOR, COPY- PROJECT MANAGER **INSPECTION STICKER # :** _____

METRO-NORTH RR AND CONTRACTORS PUSH CART INSPECTION 8/10/2018

PRIOR TO SCHEDULING AN INSPECTION, ALL CONTRACTORS SHALL PERFORM A **PRE-INSPECTION** ON THEIR PUSH CART/EQUIPMENT. FAILURES WILL RESULT IN RE-SCHEDULING AT THE NEXT AVAILABLE OPENING.

THE FOLLOWING SHALL BE ADHERED TO:

A copy of the rail cart manufacturer's specifications, including model numbers, guide wheel gage measurement, guide wheel and flange specifications, tram measurements, engineered drawings and manufactured weight capacities must be provided. If there is no criteria provided to measure the tram (alignment), wheel flange wear, and gage on a push cart, a Metro-North inspection will not be able to be performed.

1) A declaration of intended use, listing all equipment/cargo that is to be transported, must be supplied at time of inspection.
2) The guide wheel gage shall be to manufacturer's specifications.
3) Tram measurement (Diagonal measurement from center of front left guide wheel to center of rear right guide wheel vs. diagonal measurement from center of front right guide wheel to center of rear left guide wheel) **shall not exceed ¼ inch.**
4) Wheel bearings and wheel seals shall be in satisfactory condition and greased.
5) Guide wheel and flanges shall be within manufacturer's specifications and be of A.A.R profile.
6) Carts must have at least 1" tall lettering to identify carts maximum length, width, tare weight and gross weight.
7) All carts must have parking / emergency brakes that deploy with a lack of energy source (i.e. hydraulic / pneumatic pressure).
8) All carts with a rated capacity of 5,000 lbs. and above shall have service brakes with connections on both ends of the cart.
9) All carts with a rated capacity of 5,000 lbs. and under shall have a secondary means of securement to the tow vehicle in addition to the tow bar. (i.e. safety chain with spring loaded safety hasps).
10) Rail brake components (brake shoes and rigging) shall be complete and in working order.
11) Hydraulic hoses and fittings shall be in satisfactory condition and exhibit no leaks.
12) Any equipment loaded on cart that has a boom and/or rotating upper structure must have boom cradle and/or pivot lock.
13) Rail clamps shall be installed when working from the side of a cart with machinery (i.e. lifting booms, excavators, etc.).
14) Tow tab(s) with a 1-3/16 inch hole and secure tethered pin shall be installed front and/or rear at approximately 14 in. above rail when on hi-rail. If pintle receiver is used a toe tab adaptor plate must be supplied.
15) There shall be no fluid leaks.
16) 3rd rail clearance: Cart and components (i.e. machinery, steps, brackets, tool boxes), shall not extend beyond **24 inches measured from the inside of ball of rail, at a height below 10-7/8 inches, measured from the top of rail. (See 3rd rail**
17) Cart and components (i.e. machinery, steps, brackets, tool boxes), shall not extend beyond the Metro North Park Ave Tunnel
18) Cart and components (i.e. machinery, steps, brackets, tool boxes), shall not extend beyond the Metro North Minimum
19) Clearance for self-guarded frogs shall be a minimum of **2-3/4 inches** above rail on all under carriage components.
20) All components of the cart and any loaded cargo must clear the 3rd rail, electrical boxes, platforms, switch controls, etc. and be secured to prevent drifting.
21) All components that are capable of drifting, swinging, opening, etc. (i.e. booms, jibs, outriggers, tool box doors, engine covers, etc.) shall be secured appropriately before traveling on rails.
22) Clearance for self-guarded frogs shall be a minimum of **2-3/4 inches** above rail on all under carriage components.
23) All components of the cart and any loaded cargo must clear the 3rd rail, electrical boxes, platforms, switch controls, etc. and secured to prevent drifting.
24) Cart shall meet on track testing requirements up to and including 22 degree of curvature.

Final approval of items not covered on this list that may be considered questionable, unsafe or cause any danger, shall be at the inspector's discretion . **METRO NORTH RESTRICTS TRAVEL THRU SELF GUARDED FROGS and SWITHCH POINT GUARDS AT <u>NO MORE THAN 1 MPH.</u>**

Push Cart Declaration of Intended Use

Contractor name- _____

Metro North Project Manager _____

Metro North project location _____

Cart I.D. #- _____

Tare weight-_____

Gross weight-_____

Contents to be carried-_____

_____

_____

_____

_____

SECTION 01 14 00 - WORK RESTRICTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and other Division 01 Specification Sections, apply to the Work of this Section.

B. Related Sections include the following:
   1. Section 01 41 00 - Regulatory Requirements.

1.2 SUMMARY

A. This Section specifies restrictions regarding:
   1. Temporary construction.
   2. Noise.
   3. Explosives and blasting.
   4. OSHA regulated workplace activities.

1.3 REFERENCES

A. Reference Standards:
   1. New York State Building Code

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Temporary Construction:
      a. Other than maintenance and protection of traffic plans, there is no temporary construction foreseen with the station improvements that will be standing during customer use. All jacking temporary supports will be placed, in use, and removed during track outages.
   2. Noise Restrictions:
      a. The Contractor must follow all local noise ordinances and restrictions including filing for the required permits and construction stipulations from each local agency, associated with the station. As local jurisdictions vary throughout the project, requirements may also vary from station to station.
      b. Additional permit restrictions affecting the Work are specified in Section 01 41 00, Regulatory Requirements.

1.5 SITE CONDITIONS

A. Explosives and Blasting:

1. Explosives and blasting are not permitted by Metro-North in the performance of this Project.

B. Occupational Safety and Health Administration (OSHA) Restrictions:
   1. Comply with the applicable restrictions on OSHA regulated workplace activities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 18 01
PROTECTION OF UNDERGROUND METRO-NORTH RAILROAD FACILITIES

A. GENERAL

Metro-North maintains its own network of electrical, communications, gas, oil, sewer, and water facilities. The purpose of the procedures herein is to protect and prevent damage to private underground facilities owned by Metro-North Railroad. While these procedures have been developed in accordance with the requirements established by 16 NYCRR Part 753 and Dig Safely New York for public and private underground facilities, the Contractor is hereby notified that Metro-North Railroad's requirements for protection of its facilities are more restrictive than that of 16 NYCRR Part 753.

The Contractor shall take all necessary precautions to identify, locate, avoid contact with, and protect existing public, private, and Metro-North Railroad facilities. In addition to the requirements of 16 NYCRR Part 753, the Contractor shall provide for the location of Metro-North's facilities in accordance with the requirements herein.

B. DUTY TO PROVIDE NOTIFICATION

NOTE: The requirements herein do not supersede, nor lessen the responsibilities of the Contractor to locate public and private facilities in accordance with the requirements of the 16 NYCRR Part 753, commonly cited as Industrial Code 53 or Code Rule 53, and Section 16-345 of the Regulations of the Department of Public Utility Control for Connecticut.

Excavation shall be conducted in accordance with 16 NYCRR Part 753 for work in New York State, 16-345 for work in Connecticut, and the requirements specified herein. The definition of "Excavation" shall be the same as described in Section 753–1.2 Definitions of 16 NYCRR Part 753. In conformance with previously cited regulations, the Contractor must notify the local One Call Center to allow member agencies to mark locations of underground facilities prior to commencing excavation. Depending on the work location, the Contractor shall contact the appropriate One Call Center.

In addition to contacting the appropriate One Call Center, the Contractor shall request the identification of:

a) Utilities owned and operated by Metro-North Railroad in accordance with the following process, and

b) Identification of private utilities along or within the Metro-North Right-of-Way via private utility locate service companies

State	Name	Telephone	
New York	Dig Safely New York	(800) 962-7962	811
	New York City & Long Island (Five Boroughs of New York City and Nassau and Suffolk Counties of Long Island)	(800) 272-4480	
Connecticut	Call Before You Dig	(800) 922-4455	

C. TIMING OF NOTIFICATION

The Contractor shall identify the areas in which they intend to work on the Four Week Look Ahead Schedule presented to Metro-North Railroad during the Bi-Weekly Progress Meeting and/or Weekly Coordination Meeting.

The Contractor shall complete and submit a *Metro-North Railroad Utility Location Request* (see request form at end of this section) identifying locations where excavation or other types of ground disturbance are required. Said request shall be submitted to the Engineer a minimum of three (3) weeks prior to the start date of excavation.

D. IDENTIFICATION / MARK-OUT PROCESS

1. The Contractor shall physically demarcate / mark out all locations to be disturbed with white paint, flags, or stakes in accordance with the Common Ground Alliance Best Practices prior to submittal of the Utility Location Request. Should the size of the work area preclude the ability to mark the entire excavation area, the Contractor shall utilize flags or stakes to demarcate the limits of the work and paint arrows between the limits. Alternatively, if available, and agreeable to Metro-North Railroad, the Contractor may identify locations to be disturbed on project drawings or plans. Copies of the same shall be attached to and submitted with the *Metro-North Railroad Utility Location Request.*
2. The Engineer will submit the *Metro-North Railroad Utility Location Request* completed by the Contractor to the Metro-North Railroad Force Account Manager assigned to the project.
3. The Force Account Manager will distribute the *Metro-North Railroad Utility Location Request* to the appropriate Metro-North Railroad Departments responsible for conducting utility identification. The Metro-North Railroad Departments included in the utility identification process are Communications and Signal, Power, and Structures.
4. The Metro-North Departments shall conduct the identification; locating and marking the buried utilities, within (2) weeks of receiving the request from the Force Account Manager. Utilities shall be field identified in accordance with the Common Ground Alliance Best Practices utilizing the standard colors for locating utilities. (See Uniform Colors at the end of this section).
5. Upon completion of field identification, a *Metro-North Railroad Utility Location Ticket* (see ticket at end of this section) shall be completed by each of the responsible departments; Power, Communications, Signal, and Structures, and returned to the Force Account Manager.
6. The Force Account Manager shall review the *Metro-North Railroad Utility Location Tickets* to verify that they have been satisfactorily completed by each of the appropriate departments and forward them to the Engineer, or other Metro-North Railroad personnel responsible for managing the Contractor activities.
7. The Engineer shall provide copies of the completed *Metro-North Railroad Utility Location Tickets* to the Contractor and retain the originals for the project files. The Contractor shall review the *Utility Location Tickets* and compare it against the *Utility Location Request* form to ensure it has been satisfactorily completed. The Contractor shall review available As Built drawings for the work location(s) and compare the information to the field identified utilities. If a discrepancy exists between what is shown on the As Built drawings and the utilities physically marked out in the field, the Contractor shall immediately notify the Engineer.

E. DOCUMENTATION & PRESERVATION OF MARKINGS

Upon completion of the utility mark-out and receipt of the *Metro-North Railroad Utility Location Tickets*, but prior to disturbance, the Contractor shall prepare and provide a photograph or video record of the utility mark-out. The record should include a description of the general location (i.e. state, county, town/village), milepost, control point, track number and include visual landmarks to assist in identification.

It is the responsibility of the Contractor to maintain and preserve the markings provided for the duration of the work. This includes transferring mark outs outside of the work area using offsets. For work within the rail traffic envelope, it is recommended that the contractor transfer markings, or provide offsets on the side of the running rail. If some of the markings may be destroyed during the course of your work, or if the excavation will be taking place over a long period of time, take measurements and photos first. Should the Contractor be negligent in maintaining the markings, and additional work is required to re-identify utilities, the Contractor shall be responsible for the costs associated with providing the extra location services and such shall be deducted from the next progress payment.

F. VERIFICATION OF UNDERGROUND FACILITIES VIA TEST PITTING / POT HOLING

1. The Contractor shall not begin disturbance until having, 1) received the completed *Metro-North Railroad Utility Location Tickets*, 2) completed video or photo documentation of the mark out, and

3) transferred the marks as necessary to preserve them throughout the course of the work.

2. Where an underground facility has been staked, marked or otherwise identified and the tolerance zone overlaps with any part of the work area, or the projected line of a bore/directional drill intersects the tolerance zone, the excavator shall verify the precise location, type, size, direction of run and depth of such underground facility or its encasement. Verification shall be completed before the excavation or demolition is commenced or shall be performed as the work progresses.

3. The verification of underground facilities shall be accomplished by exposing the underground facility or its encasement to view by means of hand dug test pits at one or more points where the work area and tolerance zone overlap, or more points as designated by Metro-North Railroad. The Contractor shall excavate Test Pits / Pot Holes to identify the actual locations of the buried utilities/facilities. Unless otherwise identified in the project documents, the Contractor shall assume the following:

    a) one (1) test pit will be required every twenty-five feet (25') if proposed excavation is within five feet (5') of an existing utility,

    b) one (1) test pit will be required wherever an excavation is crossing an existing utility,

    c) within interlockings, one (1) test pit will be required every fifty feet (50') between opposing home signals.

    d) test pits will be required adjacent to each substation, railroad facility, and abandoned utility, or appurtenances thereto, to determine location and direction of buried utilities emanating from or leaving said facilities

4. The Contractor is urged to consider use of soft excavation methods (i.e. vacuum excavation).

5. Powered or mechanized equipment may be used within the tolerance zone for removal of pavement or masonry, but only to the depth of such pavement or masonry. Only when agreed to in writing by Metro-North Railroad, may powered equipment be used within the tolerance zone below the depth of pavement or masonry prior to the verification of the location of facilities.

6. Metro-North Railroad, or their agents and Contractors working under their direct supervision, may use powered equipment to locate their own facilities within the tolerance zone.

7. Unless otherwise identified, the minimum size of Test Pits shall be one (1) cubic yard. Should the Contractor not be able to locate the marked utility within the Test Pit area, the Contractor shall enlarge the test pit excavation towards the direction the utility is most likely located, or as directed by the Engineer. Once the test pits confirm utility locations, the Contractor will be released to excavate in that area.

8. Existing utilities shall be taken out of service (i.e. de-energized, depressurized) and tested to verify the same, prior to being spliced into, demolished, removed, or otherwise disturbed. The Contractor shall implement a means of positively identifying existing utilities to be disturbed during the work. A means of identifying the utility as "in service" or "out of service" shall be implemented and made known to project personnel.

G. UNVERIFIABLE UNDERGROUND FACILITIES

Should the Contractor be unable to verify the location of a facility, after diligent search at a reasonable depth, excavation shall not be allowed to proceed and the Contractor shall notify the Engineer. The Engineer will contact the Force Account Manager and inform them of the inability to locate the previously marked utility. The Force Account Manager will notify the representative of the appropriate Metro-North Department having marked the utility. Within (24) twenty-four hours of notification, this department shall return to the area and attempt to further identify the location of the utility, or use other means mutually agreeable to the Contractor and Metro-North Railroad (ie. continue to hand excavate until utility is located). This department will identify if and where any additional test pits are necessary to locate/expose the utility, or if problem areas exist that could restrict the Contractor's excavation.

H. COMMENCMENT OF EXCAVATION OR DEMOLITION

1. The excavator may proceed with excavation or demolition on the stated commencement date if, prior thereto, he or she has received completed *Metro-North Railroad Utility Location Tickets* from each Metro-North Department identifying that:

   a. No underground facilities were located in or within fifteen feet (15') of the work area; or

   b. That any underground facility located in or within fifteen feet (15') of the work area has been marked

2. The excavator may proceed with the excavation or demolition prior to the stated date of commencement only if he or she has received notification from each department that no underground facilities are located in or within fifteen feet (15') of the work area.

3. The excavator shall not commence the excavation or demolition on the stated commencement date if he or she has been notified by Metro-North Railroad that the marking of an underground facility located in or within fifteen feet (15') of the proposed work area will not be completed on the stated commencement date. In such case, Metro-North Railroad shall promptly report such to the excavator and inform of a prompt and practicable completion date, which in no case shall be more than two (2) working days after the excavator's stated commencement date, unless a longer period is agreed to by both parties.

I. RESPONSIBILITIES OF THE EXCAVATOR

1. Every excavator shall be familiar with the provisions of this procedure and 16 NYCRR Part 753, especially those relating to size and depth indications, color coding, center line or offset staking or marking and the location of underground facilities by designations other than staking or marking.

2. Whenever the excavator determines that a review of the staking, marking or other designation is necessary or that additional information is required, he or she shall notify the Engineer.

3. Starting on the stated commencement date, the excavator shall be responsible for protecting and preserving the staking, marking or other designation until no longer required for proper and safe excavation or demolition work at or near the underground facility.

4. Whenever mechanized excavation equipment is utilized within five feet (5') of a facility, a ground spotter shall be provided to oversee the excavation.

J. POWERED EXCAVATION LIMITATIONS

The Contractor shall not proceed with excavation until the locations of the utilities shown on the as-built drawings and those marked in the field are confirmed through manual excavation of test pits. Metro-North Railroad and the Contractor must concur that the procedures herein were followed before production excavation begins.

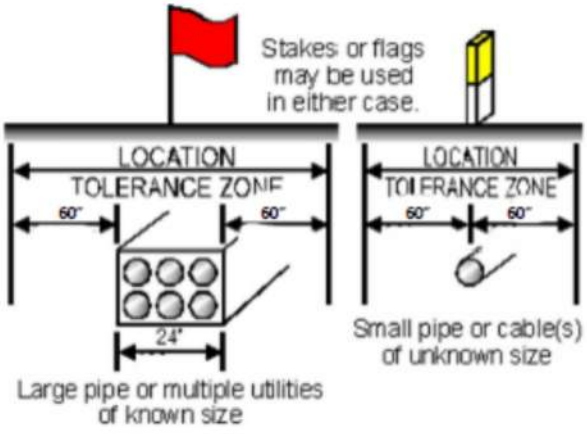
After verifying the location of an underground facility, the Contractor may utilize powered excavation equipment as long as it does not endanger the facility. At no time shall the Contractor employ powered or mechanical excavating equipment closer than twelve inches (12") in any direction from the staked, marked or otherwise designated or known outside diameter or perimeter of such facility or its protective coating unless agreed to in writing by Metro-North Railroad. Upon request, any such written agreement shall be furnished to the Contractor by Metro-North Railroad.

K. TOLERANCE ZONE

1. Before mechanized digging equipment is used in a Tolerance Zone, the presence and location of the facility must be verified. Refer to the diagram for an understanding of the Tolerance Zone.

2. For markings that indicate the width of the facility, the tolerance zone is the width of the facility plus an additional five feet (5') on either side of the facility. For example, the facility on the left is marked as being twenty four inches (24") wide. So five feet (5') on either side gives us an approximate location or Tolerance Zone of twelve feet (12'). (see diagram)

3. For markings that do not indicate the width of the facility, the tolerance zone is five feet (5') on either side of the markings. No width is provided for the facility on the right, so five feet (5') on either side gives us an approximate location or Tolerance Zone of ten feet (10'). (see diagram)



L. DISCOVERY OF UNKNOWN FACILITIES

1. Should the Contractor uncover, unearth, or otherwise identify an unmarked / unknown facility, excavation that may further disturb said utility shall cease, and the Contractor shall immediately notify the Engineer. Excavation shall not proceed until the utility is identified and a determination can be made on how to proceed by Metro-North Railroad.

2. The Engineer will contact the Force Account Manager and inform them of the unmarked/unknown facility.

3. The Force Account Manager will notify the representatives of the appropriate Metro-North Departments.

4. Within twenty-four (24) hours of notification, these departments shall return to the area and attempt to identify the utility. The responsible department will identify if and where any additional test pits are necessary to locate/expose the unmarked utility, and test the utility as necessary to determine if the utility is in service or out of service / abandoned. If abandoned or no longer in service, the responsible department may authorize the immediate removal of the interference, or will provide direction as how to handle the unmarked utility as soon as possible, but no longer than twenty-four (24) hours from time of field identification by the department.

5. The Contractor is hereby notified that Metro-North Force Account Departments are subject to call out for Railroad emergencies. In this case, the Contractor is advised to identify other work that can be completed in addition to the anticipated week's production.

M. DAMAGE TO UNDERGROUND FACILITIES

1. Excavators shall take all reasonable precautions to prevent contact or damage to underground facilities and their protective coatings, including but not limited to, compliance with accepted engineering practices and any reasonable directions provided by Metro-North Railroad.

2. In the event of contact with or damage to an underground facility, the excavator shall immediately notify the Engineer. All excavation or demolition in the immediate vicinity of the contacted or damaged portion of the underground facility shall be suspended until such portion is repaired and the Engineer advises the excavator that excavation or demolition may proceed.

3. No backfilling shall be done by the excavator in the vicinity of the contact or damage until Metro-North Railroad conducts an inspection and makes any necessary repairs; and, the excavator shall undertake no repairs unless and until authorized by Metro-North Railroad.

4. Should damage to an underground facility occur and it be determined that the Contractor is negligent in its actions; it did not exercise reasonable precautions to prevent contact or damage to underground facilities and their protective coatings, the Contractor is responsible for all costs associated with the repair and restoration of the damage facility. Such costs shall be deducted from the Contractor's next progress payment.

N. IDENTIFICATION OF UNDERGROUND FACILITIES IN DANGER OF FAILING

1. An excavator who by removing the surrounding materials exposes an underground facility which in his or her judgment appears to have failed or to be in potential danger of failing from corrosion or other causes shall immediately report such condition to the Engineer.

2. The excavator shall delay any further work in the immediate vicinity of such underground facility which could jeopardize it but may proceed in areas not affecting the questionable facility.

3. The excavator may proceed in such immediate vicinity after the Engineer responds and takes necessary action in regard thereto and advises the excavator that he or she may proceed.

O. SUPPORT AND PROTECTION FOR UNDERGROUND FACILITIES

1. An excavator shall provide prompt and adequate support and protection for every underground facility located in the work area as is reasonably specified by the Engineer.

2. In the absence of any specifications, the excavator shall provide support and protection in accordance with generally accepted engineering practice, including but not limited to shoring and bracing.

3. Support shall be at least equivalent to the previously existing support and shall protect the underground facility against freezing and against traffic and other loads.

4. Support shall be maintained during excavation, during backfilling and, if necessary, after backfilling is completed.

5. Metro-North Railroad may, in agreement with the excavator, provide such support.

P. BACKFILLING REQUIREMENTS

1. An excavator performing excavation or demolition at an underground facility shall backfill such excavation with materials and in such manner as specified by the Engineer or, in the absence of such specifications, with suitable materials and in such manner as will avoid damage to, and provide proper support for, such underground facility and its protective coating both during and after backfilling operations.

2. The excavator shall not place large rock, frozen earth, rubble, debris or other heavy or sharp materials or objects which could cause damage to or scraping against any underground facility.

3. The backfill beneath and around any underground facility shall be properly compacted in accordance with generally accepted engineering practice.

4. Heavy loads and excessive forces shall not be imposed on any exposed underground facility at any time during backfilling operations.

Q. EMERGENCY REQUIREMENTS

1. In the event of an emergency involving danger to life, health or property as a result of damage to an underground facility containing gas or liquid petroleum products or as a result of an electrical short or escape of gas or hazardous fluids, the excavator shall:

   a. Proceed to evacuate his or her employees and all other endangered persons from the

immediate vicinity to the best of his or her ability;

b. Immediately call 911 and the Engineer to inform of the exact location, nature of the emergency and type of underground facility which is affected.

R. RESPONSIBILITY TO EMPLOYEES

Every excavator subject to the provisions of this Part shall make certain that all of his or her employees directly involved in excavation or demolition are thoroughly familiar with the applicable provisions of this Part and especially the provisions of this Subpart relating to their safety.

S. DOCUMENTATION & MARKING OF FACILITIES

1. As to facilitate future identification, the Contractor shall identify all in service and abandoned utilities on As Built drawings.
2. The Contractor shall mark all new buried utilities with warning tapes specifically designed and manufactured for subgrade utility identification. The warning tape shall be of durable impervious material, designed to withstand extended underground exposure without material deterioration or fading of color. All tapes, unless otherwise directed by the specific utility, shall be detectable to a depth of at least three feet (3') with a commercial radio-type metal locator. The tape shall be of the color assigned to the type of facility and shall be durably imprinted with an appropriate warning message. The tape shall also comply with the specific requirements of the utility that owns the facility.
3. Warning tapes shall be installed the entire length of the utility, in one continuous unbroken length. Tapes shall be located a minimum of twelve inches (12") above the buried utility unless the excavation's depth, other underground facilities, or other engineering considerations make this minimum separation infeasible. The tapes shall extend a minimum of two feet (2') above grade and be tied or otherwise secured to the utility where it exits the ground. This is to facilitate access to the tape to allow sending of an electronic signal to aid in future identification of the utility.

T. MEASUREMENT & PAYMENT

The Preliminary Design included test pitting of the fiber optic line at five hundred foot (500') intervals. (See Fiber Optic Line Survey-Test Pitting Information/Data.) When existing test pitting information/data is insufficient, the Design Builder shall perform additional test pitting as needed. Test pitting shall be included in the lump sum for Item 3.00 Site Prep and Earthwork.

UNIFORM COLOR CODE - UTILITY IDENTIFICATION ASSIGNED COLORS	
White	To delineate proposed excavation site
Pink	Survey markings
Green	Storm and sanitary sewers and drainage systems, including force mains and other non-hazardous materials
Blue	Water
Orange	Communication lines or cables, including, but not limited to, those used in, or in connection with, telephone, telegraph, fire signals, cable television, civil defense, data systems, electronic controls, track signal and control, and other instrumentation
Red	Electrical power lines, electrical power conduits and other electrical power facilities, railroad traction power (i.e. 3rd rail or catenary), traffic signals and appurtenances and illumination facilities
Yellow	Gas, oil, petroleum products, steam, compressed air, compressed gases and all other hazardous liquid or gaseous materials except water
Brown	Other
Purple	Radioactive materials, reclaimed water, irrigation

LIST OF LOCATING COMPANIES FOR PRIVATELY OWNED FACILITIES
(This is not a comprehensive listing; check local listings for more alternatives.)

Absolute Locating 24/7 2713 West Main Street, Unit 2, Wappingers, NY 12590 Phone: (845) 750-3157 Contact: Ryan Craven	**Pipedream Services** www.pipedreamservice.com 10 Fronckowiak Ave, Cheektowaga, NY 14227 Phone: (716) 894-9236 Contact: Steven L. Craft
Accumark, Inc. www.accumark.us 668 Stony Hill Rd, Suite 107, Yardley, PA 19067 Phone: (215) 369-3569 Contact: Van Singer, P.E.	**Premier Utility Services, LLC** www.premierlocatingllc.com 100 Marcus Blvd, Hauppauge, NY 11788 Phone:1-800-262-8600 Contact: Ed Heaney
ACS Underground Solutions www.acsunderground.com P.O. Box 448, Georgetown, CT 06829 Phone: (203) 544 7190 Contact: Ian Beaver	**ProTek Locating** www.proteklocating.com 10-37 51st Ave, 1st Floor, Long Island City, NY 11101 Phone: (718) 472-2304 Contact: Craig Anderson
Eastern Locating Services Inc. www.easternlocating.com PO Box 9485, Trenton, NJ 08650 Phone: (607) 585-0577 Contact: Ken Samu	**Puls Inc.** www.pulsinc.com 2299 Broadhead Road Suite G-1, Bethlehem, PA 18020 Phone: (610) 419-1232 Contact: Stanley Kalsky
ECSM Utility Contractors, Inc www.ECSMINC.com 1200 Walnut Bottom Rd, Suite 101, Carlisle, PA 17015 Phone: (717) 258-8001 Contact: Gerald L. Redden	**Underground Surveying, LLC** www.undergroundsurveying.com 152 Deer Hill Ave Suite 207, Danbury, CT 06810 Phone: (203) 312-9844 Contact: Peter C. Viola
Master Locators Inc. www.masterlocators.com 2426 East Helms Manor, Boothwyn, PA 19061 Phone: (610) 358-0172 Contact: Art Worthman	**Utility Survey Corp.** www.u-survey.com 87 East Main Street, Washingtonville, NY 10992 Phone: 1-800-825-9283 Contact: Garry Williams

Metro-North Railroad

SECTION 01 18 01
PROTECTION OF UNDERGROUND METRO-NORTH RAILROAD FACILITIES

UTILITY LOCATION REQUEST

(TO BE COMPLETED & SUBMITTED BY CONTRACTOR)

Date Request Submitted			
Contract Number		**Project Description**	
General Contractor Company Name			
Address			
Field Contact		Telephone	
Excavating Contractor Company Name			
Address			
Field Contact		Telephone	
Excavation Site Information			
State (circle appropriate)	**NY**	**CT**	
City, Town, Village		County	
Street Address			
Excavation site is located between… (Describe two closest intersecting streets)	1)		
	2)		
Milepost		Control Point	Track Number(s)
Excavation Dimensions (in feet)	**Length**	**Width**	**Depth**
Has proposed excavation been field identified with white paint?		**YES**	**NO**
Project drawings/plans identifying proposed excavation attached?		**YES**	**NO**
Describe work causing disturbance			
Describe equipment to be used			
Excavation Start Date		Approximate Duration (days)	
Other			
MNR Resident Engineer/Construction Manager			
Name		Phone	
MNR Force Account Manager			
Name		Phone	

UTILITY LOCATION TICKET

(TO BE COMPLETED BY METRO-NORTH RAILROAD & RETURNED TO CONTRACTOR)

Check the box applicable to the represented department

☐ Power Department ☐ Signal Department

☐ Communications Department ☐ Structures Department

Contact's Name		Phone	
Date location request received		Date location completed	

Field Mark Out complete?	**YES**	**NO**
Utilities identified within the demarcated area?	**YES**	**NO**
If Yes, Describe		

Problems encountered during utility identification/mark out?	**YES**	**NO**
If Yes, Describe		

Recommended locations of Test Pits have been marked out?	**YES**	**NO**
Additional Test Pits Required?	**YES**	**NO**
If Yes, Describe		

Notes / Special Instructions	

Response provided to the Metro-North personnel responsible for managing the Contractor's work?	**YES**	**NO**	
If Yes, provide contact's name and date notified		**Date**	

SECTION 01 20 00 - MEASUREMENT AND PAYMENT (HARTSDALE & SCARSDALE STATION)

PART 1 - GENERAL

1.1 SUMMARY

A. Provide the work of this section in accordance with requirements of the Contract Documents.

B. This Section includes but is not limited to measurement and payment criteria applicable to portions of the work performed as a lump sum, unit price, allowances and options as exercised by the Railroad during the course of the Contract shall be measured and paid in accordance with this section.

C. Defect assessment and non-payment for rejected work.

1.2 AUTHORITY

A. MNR will take all measurements and compute quantities accordingly.

B. The Contractor shall assist by providing necessary equipment, workers, and survey personnel as required.

1.3 DESCRIPTION OF BID ITEMS

The following descriptions of Bid Items for this Contract define how various items of work shall be paid:

A. Hartsdale and Scarsdale Station

1. Item No. 1 (Lump Sum) – Mobilization:
   a. This item consists of the activities necessary to begin the project. These activities will include both administrative tasks such as CPM preparation, submittals, and work schedules for staging and physical activities such as establishing a field office, communication lines, and field survey/engineering layouts.
   b. The Maximum amount for this item is 4% of the total Base Bid amount excluding allowances (Base Bid items 2 – 11) for the requirements in Sections 01 31 00, 01 35 29, 01 50 00 and 01 71 13.
   c. Five (5) percent of Item No. 1 total mobilization costs will be paid upon completion of the Metro-North Field Trailer for Hartsdale and Scarsdale Stations. Eighty-five (85) percent of the mobilization costs will be paid in 3 equal monthly payments with the first payment to be made 30 calendar days after the constructor begins actual field work. The remaining ten (10) percent of the mobilization costs will be paid upon the complete demobilization of equipment from Hartsdale and Scarsdale Station.
   d. Partial payments may be reduced by an amount determined by the Engineer if in his determination any of the following apply:

1) The plant and equipment at the site are insufficient or are not suitable for the performance of the work.
2) The plant and equipment brought on the project are not being utilized or sufficiently utilized for the prosecution of the work.
3) The plant and equipment brought on the project and committed to the work are removed from the project without permission of the Engineer.
4) In the event of a reduction in partial payments as provided herein, the remainder of the partial payments which are unpaid at the date of such reduction, will be paid with subsequent progress payments as and when the conditions stated are rectified.

2. Item No. 2 (Lump Sum) – Existing Condition:
   a. This item shall consist of all activities associated with the specification sections identified under "Division 02 - Existing Condition" as specifically detailed and indicated on the Drawings, the Technical Provisions, and as required to complete the work and the project objectives including all labor, materials, tools, equipment, and services for all the repairs at Scarsdale and Hartsdale Stations, excluding hauling and disposal of soils.
   b. This item includes the maintenance and protection of traffic pedestrian detour.
   c. This item includes the demolition of existing pavement, removal and return of unmounted railing piece (which may be repurposed as bike rack), removal a of section of railing to elevator landing, and removal of site dirt and garbage.
   d. This item includes trimming the tree branches as needed (need to be approved by Westchester County Parks Representative and MNR).

3. Item No. 3 (Lump Sum) – Hartsdale Station Improvements
   a. Work consists of two new elevators at Hartsdale Station, one per platform, including all required foundations, mechanical, electrical, fire alarm, communications, plumbing, structural and architectural components. Elevators shall be three-stop: overpass level, platform level, and grade level.
   b. Work consists of new elevator machine room, one per elevator.
   c. Work consists of new overpass extension on the inbound side to traverse over existing electrical boxes on the ground. New overpass extension will meet elevator.
   d. Work consists of a new sidewalk area with curb cut on each side of the station.
   e. Work includes all other station amenities in the overpass, including but not limited to benches, lean bars, trash receptacles, counters, and new heaters and lighting.
   f. Work includes some landscaping on the inbound side due to impacts from the new overpass extension and electrical upgrades.
   g. Work includes tasks associated with upgrade for electrical service by ConEd as shown in the Contract documents.

4. Item No. 4 (Lump Sum) – Scarsdale Station Improvements - Elevator
   a. Work consists of one new elevator at Scarsdale Station, on the inbound side, including all required foundations, mechanical, electrical, fire alarm, communications, plumbing, structural and architectural components. Elevator shall be three-stop: overpass level, platform level, and grade level.
   b. Work consists of new elevator machine room.
   c. Work consists of demolishing the existing CCTV hut and building a new CCTV room adjacent to the new elevator machine room.
   d. Work consists of a new sidewalk area with curb cut on the inbound side of the station.

e. Work consists of new motorcycle area with permeable pavers on the inbound side of the station.
f. Work includes all other station amenities in the overpass, including but not limited to benches, lean bars, trash receptacles, counters, and new heaters and lighting.
g. Work consists of new connecting platform from elevator platform level landing to station platforms and overpasses, with new ADA code compliant railing.

5. Item No. 5 (Lump Sum) – Scarsdale Station Improvements – Jacking of Overpass
   a. Work consists of separate, relocate and re-secure existing passenger overpass structure and stair/stair enclosure structure to the inbound platform side to meet the required height from top of rail. including modifications to the threshold to the existing elevator on the outbound side, as well as to the walkway from the sidewalk. Per contract drawing, this work consists not limited to modifications of steps of both outbound and inbound stairs to overpass, repairs of roof canopy, eaves, wood ceiling, terracotta tiles which are severed by "jacking." This work also consists of modification/repair or replace the one section of platform which is severed by "jacking" shoring foundation, conduits relocation/adjustment, and all work be necessary or incidental thereto.

B. Unit Price Items

1. Item No. 6 (Ton) – Hauling & Disposal of Hazardous Soil:
   a. This item consists of hauling and off-site disposal of hazardous soil in accordance with Metro-North procedure and standards, the contract documents and the quantities listed on the bid sheet. A list of Metro-North pre-qualified haulers and landfills is included in the contract specifications.
   b. This item consists of all labor, materials, tools, equipment and services required by the Contract Documents for the construction of all the components specified and any other incidentals necessary to complete the work.
   c. This item shall be measured and paid based on the number of cubic yards of waste classified as hazardous soil that must be disposed of, including all labor, sampling and analysis, equipment, loading, stabilization, transport, disposal, decontamination, material documentation, permits and material to complete the work.
   d. All excavation and stockpiling related costs shall be included in the lump sum of other items in the contract-based contract work. Refer to specification 02 61 00 Sampling, Testing, Handling, Loading, Removal and Disposal of Soils.
   e. Work shall not be charged to this unit price without written authorization from Metro-North. The actual amount of work and associated cost shall be identified based on the unit price and quantity at the time when work is required.

2. Item No. 7 (Ton) – Hauling & Disposal of Non-Hazardous Petroleum Contaminated Soil:
   a. This item consists of hauling and off-site disposal of non-hazardous, petroleum contaminated soil in accordance with Metro-North procedure and standards, the contract documents and the quantities listed on the bid sheet. A list of Metro-North pre-qualified haulers and landfills is included in the contract specifications.
   b. This item consists of all labor, materials, tools, equipment and services required by the Contract Documents for the construction of all the components specified and any other incidentals necessary to complete the work.
   c. This item shall be measured and paid based on the number of cubic yards of waste classified as non-hazardous, petroleum contaminated soil that must be disposed of, including all labor, sampling and analysis, equipment, loading, stabilization,

transport, disposal, decontamination, material documentation, permits and material to complete the work.

d. All excavation and stockpiling related costs shall be included in the lump sum of other items in the contract-based contract work Refer to specification 02 61 00 Sampling, Testing, Handling, Loading, Removal and Disposal of Soils for ability to reuse soils on site. Any and all soil excavated and re-used on site shall be included in the lump sum under other items in the contract based on contract work. The reuse on site of excavated soil must be approved by Metro-North Environmental Compliance and Services Department.

e. Work shall not be charged to this unit price without written authorization from metro-North. The actual amount of work and associated cost shall be identified based on the unit price and quantity at the time when work is required.

3. Item No. 8 (Ton) – Hauling & Disposal of Excess Non-Hazardous PCB Contaminated Soil:

a. This item consists of hauling and off-site disposal of non-hazardous PCB contaminated soil that cannot be backfilled/re-used on site in accordance with Metro-North procedure and standards, the contract documents and the quantities listed on the bid sheet. A list of Metro-North pre-qualified haulers and landfills is included in the contract specifications.

b. This item consists of all labor, materials, tools, equipment and services required by the Contract Documents for the construction of all the components specified and any other incidentals necessary to complete the work.

c. This item shall be measured and paid based on the number of cubic yards of waste classified as non-hazardous PCB contaminated soil that must be disposed of, including all labor, sampling and analysis, equipment, loading, stabilization, transport, disposal, decontamination, material documentation, permits and material to complete the work.

d. All excavation and stockpiling related costs shall be included in the lump sum of the various items in the contract based contract work Refer to specification 02 61 00 Sampling, Testing, Handling, Loading, Removal and Disposal of Soils for ability to reuse soils on site. Any and all soil excavated and re-used on site shall be included in the lump sum of other items in the contract based on contract work. The reuse on site of excavated soil must be approved by Metro-North Environmental Compliance and Services Department.

e. Work shall not be charged to this unit price without written authorization from Metro-North. The actual amount of work and associated cost shall be identified based on the unit price and quantity at the time when work is required.

4. Item No. 9 (Ton) – Hauling & Disposal of Excess Non-Hazardous Soil/Fill:

a. This item consists of hauling and off-site disposal of non-hazardous soil/fill that cannot be backfilled/re-used on site in accordance with Metro-North procedure and standards, the contract documents and the quantities listed on the bid sheet. A list of Metro-North pre-qualified haulers and landfills is included in the contract specifications.

b. This item consists of all labor, materials, tools, equipment and services required by the Contract Documents for the construction of all the components specified and any other incidentals necessary to complete the work.

c. This item shall be measured and paid based on the number of cubic yards of waste classified as non-hazardous soil/fill that must be disposed of, including all labor, sampling and analysis, equipment, loading, stabilization, transport, disposal,

decontamination, material documentation, permits and material to complete the work.

d. All excavation and stockpiling related costs shall be included in the lump sum of the various items in the contract-based contract work Refer to specification 02 61 00 Sampling, Testing, Handling, Loading, Removal and Disposal of Soils for ability to reuse soils on site. Any and all soil excavated and re-used on site shall be included in the lump sum of other items in the contract based on contract work. The reuse on site of excavated soil must be approved by Metro-North Environmental Compliance and Services Department.

e. Work shall not be charged to this unit price without written authorization from Metro-North. The actual amount of work and associated cost shall be identified based on the unit price and quantity at the time when work is required.

5. Item No. 10 (Ton) – Hauling & Disposal of Excess Non-Hazardous C&D Soil/Fill:

a. This item consists of hauling and off-site disposal of non-hazardous C&D soil/fill in accordance with Metro-North procedure and standards, the contract documents and the quantities listed on the bid sheet. A list of Metro-North pre-qualified haulers and landfills is included in the contract specifications.

b. This item shall be measured and paid based on the number of cubic yards of waste classified as non-hazardous C&D soil/fill that must be disposed of, including all labor, sampling and analysis, equipment, loading, stabilization, transport, disposal, decontamination, material documentation, permits and material to complete the work.

c. All excavation and stockpiling related costs shall be included in the lump sum of the various items in the contract based contract work. Refer to specification 02 61 00 Sampling, Testing, Handling, Loading, Removal and Disposal of Soils for ability to reuse soils on site. Any and all soil excavated and re-used on site shall be included in the lump sum of other items in the contract based on contract work. The reuse on site of excavated soil must be approved by Metro-North Environmental Compliance and Services Department.

d. Work shall not be charged to this unit price without written authorization from Metro-North. The actual amount of work and associated cost shall be identified based on the unit price and quantity at the time when work is required.

6. Item No. 11 (Ton) – Rock Removal and Disposal

a. Work consists of rock removal and disposal at Scarsdale Station that may be required to install new elevators and any walkways to the platform from the elevators.

b. Work shall not be charged to this unit price without written authorization from Metro-North. The actual amount of work and associated cost shall be identified based on the unit price and quantity at the time when work is required.

C. Allowances

1. Item No. 12 (Lump Sum) – Buried Unforeseen Materials in Conflict with New Construction:

a. This item has an allowance of $25,000.00 for all design, labor, materials, tools, equipment, and services required for the excavation, removal, relocation, abatement and legal disposal of all materials in conflict with new construction work, including but not limited to old foundations, railroad ties, tanks, utilities or any other hidden obstruction, that is NOT included in the base scope of work of the contract documents or that could NOT be reasonably anticipated from the contract documents.

b. Work shall not be charged for this allowance without written authorization from Metro-North. The actual amount of work and associated costs shall be negotiated at the time the work is defined and required. In the event the full amount of the allowance is not utilized, the remaining unused funds shall be credited to the Authority at the end of the job.
c. Payment based on actual cost.

2. Item No. 13 (Lump Sum) – Asbestos Abatement:
   a. This item is an allowance of $50,000 for asbestos abatement including testing, demolition, hauling and off-site disposal in accordance with Metro-North procedures and standards and the contract documents for work NOT depicted and described in Technical Specifications 02 83 00. This allowance is for asbestos abatement work NOT included in other items of the base contract.
   b. A list of Metro-North pre-qualified haulers and landfills is included in the Contract specifications. All requirements in the contract documents for this work shall be followed for work performed under this allowance item. This item consists of all labor, materials, tools, equipment and services required by the Contract Documents for the construction of all the components specified and any other incidentals necessary to complete the work.
   c. Work shall not be charged for this allowance without written authorization from Metro-North. The actual amount of work and associated costs shall be negotiated at the time the work is defined and required. In the event the full amount of the allowance is not utilized, the remaining unused funds shall be credited to the Authority at the end of the job.
   d. Payment is based on actual cost.

3. Item No. 14 (Lump Sum) –Lead Abatement:
   a. This item is an allowance of $50,000 for lead abatement including testing, demolition, hauling and off-site disposal in accordance with Metro-North procedures and standards and the contract documents for work NOT depicted and described in Technical Specifications 02 82 00. This allowance is for lead abatement work NOT included in other items of the base contract.
   b. A list of Metro-North pre-qualified haulers and landfills is included in the Contract specifications. All requirements in the contract documents for this work shall be followed for work performed under this allowance item. This item consists of all labor, materials, tools, equipment and services required by the Contract Documents for the construction of all the components specified and any other incidentals necessary to complete the work.
   c. Work shall not be charged for this allowance without written authorization from Metro-North. The actual amount of work and associated costs shall be negotiated at the time the work is defined and required. In the event the full amount of the allowance is not utilized, the remaining unused funds shall be credited to the Authority at the end of the job.
   d. Payment is based on actual cost.

4. Item No. 15 (Lump Sum) – Relocation of various MNR Items:
   a. This allowance is an allowance of $25,000.00 for assisting MNR with the relocation of MNR items at various locations on site. This allowance is for items NOT included in the base scope of work of the contract documents or that could NOT be reasonably anticipated from the contract documents.

b. Work shall not be charged for this allowance without written authorization from Metro-North. The actual amount of work and associated costs shall be negotiated at the time the work is defined and required. In the event the full amount of the allowance is not utilized, the remaining unused funds shall be credited to the Authority at the end of the job.
c. Payment is based on actual cost.

5. Item No. 16 (Lump Sum) – Test Pits:
   a. This item is an allowance of $10,000.00 for additional test pits. This item consists of all labor, materials, tools, equipment and services required above and beyond what is required by the Contract Documents. Test pits as required under the base contract shall be as noted in the base contract.
   b. Work shall not be charged for this allowance without written authorization from Metro-North. The actual amount of work and associated costs shall be negotiated at the time the work is defined and required. In the event the full amount of the allowance is not utilized, the remaining unused funds shall be credited to the Authority at the end of the job.
   c. Payment is based on actual cost.

6. Item No. 17 (Lump Sum) – Additional Station Signage:
   a. This item is an allowance of $25,000.00 for additional signage. This item consists of all labor, materials, tools, equipment and services required above and beyond what is required by the Contract Documents. Signs, as required under the base contract, shall be as noted in the base contract.
   b. Work shall not be charged for this allowance without written authorization from Metro-North. The actual amount of work and associated costs shall be negotiated at the time the work is defined and required. In the event the full amount of the allowance is not utilized, the remaining unused funds shall be credited to the Authority at the end of the job.
   c. Payment is based on actual cost.

7. Item No. 18 (Lump Sum) – Compensation for Track Outage Delay:
   a. This item is an allowance of $60,000.00 for Metro North's exclusive use, for compensation for cancellations of Contractor effort due to unexpected reasons determined by Metro North
   b. Work shall not be charged for this allowance without written authorization from Metro-North. The actual amount of work and associated costs shall be negotiated at the time the work is defined and required. In the event the full amount of the allowance is not utilized, the remaining unused funds shall be credited to the Authority at the end of the job.
   c. Payment is based on actual cost.

8. Item No. 19 (Lump Sum) – New Landscaping Items and Installation of Landscaping:
   a. This item is an allowance of $50,000.00 for furnishing and installing new landscaping items at Hartsdale and Scarsdale Stations. This item consists of all labor, materials, tools, equipment and services required above and beyond what is required by the Contract Documents for landscaping and any other incidentals necessary to complete the work. Landscaping as required under the base contract shall be as noted in the base contract.
   b. Work shall not be charged for this allowance without written authorization from Metro-North. The actual amount of work and associated costs shall be negotiated at

the time the work is defined and required. In the event the full amount of the allowance is not utilized, the remaining unused funds shall be credited to the Authority at the end of the job.

c. Payment is based on actual cost.

9. Item No. 20 (Lump Sum) ConEd service:
   a. This item is an allowance of $50,000 for upgrade of electrical service by ConEd. This item consists of all labor, materials, tools, equipment and services required above and beyond what is required by the Contract Documents related to the upgrade of electrical service and any other incidentals necessary to complete the work. Upgrade of electrical service under the base contract shall be as noted in the base contract.
   b. Work shall not be charged for this allowance without written authorization from Metro-North. The actual amount of work and associated costs shall be negotiated at the time the work is defined and required. In the event the full amount of the allowance is not utilized, the remaining unused funds shall be credited to the Authority at the end of the job.
   c. Payment is based on actual cost.

1.4 PAYMENT

A. Payment for Work governed by Lump Sum shall be made on the basis of a line item breakdown for each station furnished by the Contractor. The line item breakdown shall include a listing of line items, line item quantities, line item costs and line item total costs per station. The sum of line item costs shall be equal to the total lump sum amount. Payment shall be made on a percentage basis of work completed per each individual line item on the detailed cost breakdown.

B. Payment of all work shall not be made until the work has been inspected and accepted by the Engineer. All costs for work to be performed shall be covered by the bid prices and further broken down in the detailed line item breakdown.

C. Payment of Work governed by unit prices shall be made on the basis of the actual measurements and quantities accepted by the Engineer multiplied by the unit price for that Item of Work.

D. Payment of work governed by options shall be made based on Metro-North exercising the option and paid in the accordance with lump sum payments as described above.

E. Payment for work governed by construction allowances shall be made based on percentage of work complete as determined by MNR. Costs shall be submitted in accordance with the Terms and Conditions Chapter entitled “Changes to the Contract.”

F. Payment for any Asbestos and/or lead abatement work shall only be processed with a Manifest.

1.5 DEFECT ASSESSMENT

A. The Contractor shall replace the work, or portions of the work not conforming to specified requirements.

B. If, in the opinion of Metro-North, it is not practical to remove and replace the Work, Metro-North will direct one of the following remedies:
   1. The defective Work will be partially repaired to the instructions of Metro-North, and the unit price will be adjusted at the discretion of Metro-North.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and other Division 01 Specification Sections, apply to the Work of this Section.

B. Related Sections include the following:
   1. Section 01 20 00 – Measurement and Payment.
   2. Section 01 32 00 – Construction Progress Documentation.
   3. Section 01 33 00 – Submittal Procedures.
   4. Section 01 43 00 – Quality Assurance.
   5. Section 01 50 00 – Temporary Facilities and Controls.

1.2 SUMMARY

A. This Section specifies requirements for:
   1. Project Coordination:
      a. Coordinating the Work of this Contract with other work affecting or affected by this Contract.
      b. Coordinating the work of the Contractor's employees, Subcontractors, Suppliers, manufacturers, and fabricators.
   2. Project Meetings:
      a. Attendees required at Project meetings.
      b. Administration of Project meetings, including, but not limited to:
         1) Frequency of Project meetings.
         2) Minimum requirements for meeting agendas.
         3) Project meeting procedures.
         4) Responsibilities of meeting attendees.
            a) Responsibility for recording and distributing meetings minutes.
      c. This Section describes the various types of Project meetings, including.
         1) The Preconstruction Conference.
         2) Progress Meetings.
         3) Pre-installation Meetings.
         4) Progress Schedule Update Meetings.
         5) Other meetings.
   3. Electronic Communication Protocols.

1.3 REFERENCES

A. Abbreviations and Acronyms:
   1. EEO: Equal Employment Opportunity.
   2. QC: Quality control.

B. Reference Standards:
   1. State of New York:
      a. New York State Energy Research and Development Authority (NYSERDA):
         1) New York State Executive Order No. 111 – "Green and Clean" State Buildings and Vehicles Guidelines.
      b. Official Compilation of the Rules and Regulations of the State of New York (NYCRR).
         1) NYCRR 16 Part 753 Protection of Underground Facilities.
   2. United States Government:
      a. Buy America Act (Pub. L. 103–429, 49 U.S.C. 5323(j))
      b. Federal Transit Administration (FTA):
         1) 49 CFR 661 Buy America Requirements.
      c. Occupational Safety and Health Administration (OSHA):
         1) 29 CFR 1910 Occupational Health and Safety Standards.
         2) 29 CFR 1926 Safety and Health Regulations for Construction.

1.4 PROJECT COORDINATION

A. Coordination with Local Jurisdictions and Agencies:
   1. Coordinate the Work of this Contract with State and local governmental and private agencies having jurisdiction over the Work, and document and comply with their requirements.
      a. Coordinate traffic control measures with appropriate agencies in accordance with Section 01 50 00, Temporary Facilities and Controls.
      b. Document and meet the requirements of governmental and private agencies having jurisdiction over utility work, and insure that all required permits have been obtained before connecting permanent and temporary utilities to the Work of this Contract.
      c. Strictly enforce safety rules and regulations imposed by the State of New York, the Occupational Safety and Health Administration (OSHA), Metro-North, and others having jurisdiction.
   2. State and local jurisdictions and agencies include, but are not limited to the following:
      a. Metro-North.
      b. State of New York.
         1) New York State Department of Environmental Conservation (NYSDEC).
         2) New York State Department of Transportation (NYSDOT).
      c. Westchester County, NY.
      d. Town Village of Scarsdale, NY.
      e. Town of Greenburgh, NY.

B. Coordination with Area Residents:
   1. Notify area residents of work to be done that may affect their neighborhood or property.
   2. Prior to beginning the Work, survey dwellings and properties near the Project as specified in Section 01 32 00, Construction Progress Documentation, and note conditions to prevent claims.

1.5 FACILITY SERVICES COORDINATION

A. Coordinate the Work of this Contract with local utilities, whether or not they are listed in the Contract Documents, so that utility interconnections and interfaces to the Work do not delay this Contract; and so utility service to the community is not adversely impacted.
   1. Notify utility companies or other parties being affected by construction; and endeavor to have necessary adjustments of public or private utility fixtures, pipelines, or other appurtenances made as soon as possible.
   2. Notify public utilities operating overhead power lines whenever construction operations are within clearance envelopes established by statute.
   3. Two to ten days prior to the start of digging or excavation Work not counting the day of the call, contact Dig Safely. New York by calling 1- 800-962-7962 or 811 to arrange for utility owners to locate and mark their underground utilities.
      a. Comply with applicable State of New York statutes.
         1) Strict compliance with NYCRR 16 Part 753 is obligatory.
      b. If unexpected active underground facilities are encountered during the performance of the Work, immediate notify the Metro-North Engineer.

B. Unless otherwise shown on the Contract Drawings or stated in the Specifications, maintain all utilities whether underground or overhead in continuous service throughout the entire Contract period.
   1. Safeguard and maintain conflicting utilities as shown on the Contract Drawings, including overhead wires and cables and their supporting poles, and underground utilities, whether or not they are inside or outside a proposed trench.
      a. The owners of conflicting water lines, gas lines, meter boxes, and other utility appurtenances at the Site may be asked to relocate their utilities prior to the beginning of the Work this Contract.

C. Coordinate acquisition of temporary utilities to support the Work of this Contract in accordance with Section 01 50 00, Temporary Facilities and Controls.

D. In the event that an existing service, or other large structure, is found to impede the performance of the Work, notify the Metro-North Engineer as soon as practicable.
   1. If in the course of the Work a conflicting utility line that was not shown on the Contract Drawings is discovered, Metro-North will either negotiate with the utility owner to relocate the line, relocate the utility using Metro-North forces, change the alignment and grade of the conflicting trench, or declare the conflict as extra work to be performed at an agreed upon negotiated price.
      a. If a price cannot be agreed upon, then perform the work as “Force Account Work”.
   2. If temporarily or permanently relocating or shutting down any utility or appurtenance will simplify construction operations, the Contractor at his option may make the necessary arrangements and agreements with the utility’s owner for any expense related to the relocation or shutdown and construction if at no increase in the Contract Price, and if the following is observed:
      a. Reconstruct all property to its original or new location as soon as possible and to a condition at least as good as its previous condition.
      b. Any such relocation or shutdown and reconstruction of utilities is subject to inspection and approval by both the Metro-North Engineer and the owner of the utility.

1.6 MULTIPLE CONTRACT COORDINATION

A. The Metro-North reserves the right to perform other or additional work at or near the Site, including any storage site, with forces other than those of the Contractor.
   1. Utility construction and development projects may also occur adjacent to or within the Contract limits of work.

B. If the Contract Documents give notice that other work may affect the Work of this Contract, do the following:
   1. Attend construction progress meetings in accordance with the requirements specified herein.
   2. Review drawings and Contractor submittals from related contracts for adequacy of coordination and compatibility with the Work of this Contract, and report any shortcomings of those drawings and submittals when found.
   3. Include the cost of the resulting coordination effort in the Guaranteed Maximum Price (GMP) bid for this Contract.

C. Take the initiative in identifying, defining, coordinating, and documenting all interface points between the Work of this Contract and adjacent work.
   1. Survey the physical, mechanical, and electrical interfaces of related contracts and facilities.
      a. Document all interface points identified.
      b. Report any shortcomings of interface points and facilities that affect the Work of this Contract.
   2. When the Work of this Contract overlaps with other contracts entered into by the Metro-North, coordinate the Work of this Contract with the other Contractors working at or near the construction Site, with the Metro-North Engineer, with the Metro-North Engineer's inspectors, and with the Metro-North personnel.
      a. Request each Contractor involved to submit a current schedule for the work of their contract for review.
      b. After this review and consultations, the Metro-North Engineer will determine if the schedules are acceptable or if corrections are needed to coordinate between contracts.
         1) If corrections are required, update the Contract's progress schedule in accordance with the requirements of Section 01 32 00, Construction Progress Documentation, to reflect the required corrections.
      c. The Contractor, through the Metro-North Engineer will resolve any disagreements that may arise among the Contractors over the method or sequencing of the Work.
         1) In case of unavoidable interferences or schedule impacts, the Contractor, through the Metro-North Engineer will establish the priority of the work elements, which in general will be in the sequence that the contracts were awarded.
         2) The Metro-North Engineer's decision in these matters is final.
   3. Whenever the work of other Contractors occurs either within or next to this Contract's Site, do the following:
      a. Cooperate with other Contractors' forces.
      b. Carry out the Work under this Contract in a way that will minimize interference and delay for all forces involved.
      c. Place and dispose of the materials being used so as not to interfere with the operations of other Contractors' forces.
      d. Coordinate with other Contractors to perform the Work in proper sequence to meet schedule requirements of this and the other contracts.

D. Take responsibility for any damages to or interruption of service caused by the Work of this Contract.
   1. If the Work performed as a part of this Contract damages the work of another Contractor, promptly repair or replace the damaged work at no increase in the Contract Price.

1.7 PROJECT MEETINGS

A. Meeting Participation:
   1. Participation in all Project meetings specified herein is mandatory, and appropriate representatives of the Contractor's staff, Subcontractors, Suppliers, manufacturers, and fabricators are required to attend.
      a. Attend meetings prepared to discuss the items which the Design- Builder has been notified will be on the meeting's agenda and those specified in this Section.
         1) Advise the Metro-North Engineer of items to be added to a meeting's agenda at least 24 hours in advance of the meeting.

B. Minutes of Meetings:
   1. The Metro-North Engineer is responsible for recording the minutes of all meetings, and for distributing them to all parties present and to those on an agreed upon distribution list within five (5) Days of each meeting.

C. The Preconstruction Conference:
   1. The Metro-North Engineer will schedule a Preconstruction Conference within 21 days of the Notice to Proceed, and will notify all parties concerned of the exact time and place of this meeting.
      a. Attendance at this meeting by the Contractor and his principal Subcontractors is mandatory; but the Contractor has the option to invite additional parties as required.
      b. Do not commence the Work of this Contract without first attending the Preconstruction Conference.
      c. The meeting is typically held at the Site, or at an alternate location designated by the Metro-North Engineer.
      d. The Metro-North Engineer will conduct the Preconstruction Conference, and will address the conduct of the Work, lines of communication, and the similar items as indicated in Subparagraphs 1.7.C.3.a and 1.7.C.3.b.
      e. The Metro-North Engineer will invite Metro-North representatives to the Preconstruction Conference.

D. Other entities concerned with the progress, or involved in planning, coordination, or performance of future activities, will also be represented.
   1. All participants at the conference must be familiar with the Project, and authorized to conclude matters relating to the Work.
   2. Preconstruction Conference's Agenda:
      a. The Preconstruction Conference's agenda will include at a minimum the following items, but is not limited to these items:
         1) Establishing a sound working relationship among all parties, including the Contractor and his Subcontractors, the Metro-North representatives, the Metro-North Engineer's staff, representatives from affected utilities, and other appropriate agencies.
            a) Designate which employees are the Contractor's responsible personnel.

b) Distribute a list of the Contractor's proposed Subcontractors.

2) Distributing and discussing the Contractor's Preliminary Schedule.
   a) Discuss critical Work sequencing.
   b) Discuss progress schedules.
3) Distributing and discussing of the Contractor's Preliminary Schedule of Values required by the Agreement and the Contract Terms and Conditions, and Section 01 20 00, Measurement and Payment Procedures.
   a) Discuss using the Schedule of Values to prepare payment requests.
4) Discussing Submittal schedules and procedures, and of delivery schedules and procedures.
   a) Discuss submittal of Working Drawings, Shop Drawings, Project Data, and Samples.
   b) Discuss major equipment deliveries and priorities.
   c) Discuss materials furnished by the Metro-North.
   d) Discuss the requirement to provide a Submittal Schedule as specified in Section 01 33 00, Submittal Procedures.
   e) Discuss the requirement to provide a Delivery Schedule.
5) Reviewing the concerns of the community.
6) Reviewing safety requirements:
   a) Define the Contractor's responsibility for making arrangements for safety, first aid, emergency actions, security, and a full-time safety representative.
   b) Discuss Metro-North requirements for a Contractor's Safety Program and Safety Plan, Surveillance and Security Control Program, and Site Security Plan; and the introduction of the Metro-North construction safety and security representatives.
   c) The Metro-North is responsible for providing a construction "hotline" telephone number which will be answered by Metro-North representative during regular working hours, or by an answering service during other times, for the Contractor to use for emergency communications with the Metro-North.
   d) The Contractor is responsible for holding weekly safety meetings and for holding tool box/lunch box meetings as required.
7) Discussing procedures for processing field decisions and Contract Change Orders.
8) Discussing requirements for maintaining record documents.
9) Discussing miscellaneous procedures, such as safety, recordkeeping, first aid, security, housekeeping, and similar items.
10) Discussing office and storage area locations.
11) Discussing the Owner's use of premises requirements.
12) Discussing coordination with affected utilities.
13) Open discussion.

b. The Metro-North Engineer is responsible for addressing the following items at the preconstruction conference:
   1) Responsibilities and authorities of Metro-North's and the Metro-North Engineer's organizations.
   2) Equal Employment Opportunity (EEO) and affirmative action requirements.
   3) Requirements of labor provisions stipulated by the U.S. Department of Transportation (DOT) as required.
   4) Laws, codes, traffic regulations, permit requirements, and other public agencies' regulations.

a) Buy America Act requirements.
b) New York State Executive Order No. 111.
c) Other laws, codes, regulations, and requirements.

5) Procedures for processing Requests for Information (RFIs), Change Requests, Change Orders, Shop Drawings, Working Drawings, Product Data, and Samples
6) Monthly pay estimate cut-off dates.
7) Partial and final payments.
8) Community affairs functions and procedures.
9) A list of dates for generating data for the draft Project Schedule Monthly Update Reports in accordance with Section 01 32 00, Construction Progress Documentation.

c. The Contractor is responsible for performing the following activities at the Preconstruction Conference:

1) Ensuring that the Contractor's Project Manager/Superintendent, Quality Control Manager, Safety Representative, Equal Employment Opportunity (EEO) Officer, Subcontractor representatives, and Community Affairs representatives attend the meeting.
   a) Introduce Contractor representatives, and briefly describe each person's responsibilities.
      (1) Prepare and distribute the Contractor's Organization Chart and Contact List.
   b) Distributing and discussing a list of the major Subcontractors proposed.
      (1) Discussing how the Contractor's quality control (QC) personnel will perform independently of the rest of the construction workforce to insure quality in the constructed facilities as required in Section 01 43 00, Quality Requirements.
   c) Identifying the public involvement contact, and discuss how they will work with the Metro-North public involvement representative.
2) Distributing and discussing the Preliminary Contract Construction Schedule.
   a) Submit the Preliminary Construction Schedule in accordance with Section 01 32 00, Construction Progress Documentation.
      (1) Describe the construction sequencing.
      (2) Discuss major equipment deliveries and priorities.
      (3) Discuss the coordination and notifications required for utility Work.
      (4) Describe temporary street closings and street restoration.
3) Submitting the Preliminary Schedule of Values.
4) Describing the general layout of the Site.
   a) Discuss the use of offices, storage areas, construction areas, and temporary easements.
   b) Describe haul routes.

d. Discussing construction methods.
e. Describing noise, emissions, dust, and water pollution control.
f. Describing erosion and sediment control procedures and drawings.
g. Defining housekeeping procedures.

E. Progress Meetings:

1. Unless otherwise directed or agreed, the Metro-North Engineer will hold weekly Progress Meetings at the Site, or at an alternate location designated by the Metro-North Engineer.

a. Attend additional meetings or meetings scheduled at a different frequency as directed by the Metro-North Engineer at no increase in the Contract Price.

2. A typical Progress Meeting's agenda will include, but may not be limited to, the following items:
   a. Reviewing the minutes of the previous meetings.
   b. Noting field observations, problems, and decisions taken since the last Progress Meeting.
   c. Identifying present problems, and planning the resolution of each.
   d. Presenting the log of outstanding nonconformance reports, planned corrective actions, subsequent operations impacted, and a schedule for closure of the nonconformance reports.
   e. Reviewing the status of the Contractor's Contract Construction Schedule and Work Plan.
      1) Plan the progress of the Work for the next work period, and assess its effect on the related work of others.
         a) Present the look-ahead schedule of the Work Plan for the next 21 Days.
            (1) Prepare, distribute, and discuss a time-scaled look-ahead schedule based on and correlated with the activity numbers and descriptive nomenclature of the accepted Contract Construction Schedule.
      2) Provide a 7-day history documenting the achievements of the past 7 days.
         a) Include this as-built schedule for the previous 7 days within the look-ahead schedule.
      3) Discuss the current and previous Project Schedules and Work Plans, particularly how they relate to actual achievements.
         a) Incorporate the Metro-North Engineer's comments into the as-built schedule for the previous 7 days.
         b) Expedite the Work to insure it's completion within the approved Project Schedule.
   f. Reviewing Project safety requirements.
   g. Reviewing the status of other Design Builders work in regards to shared access.
   h. Coordinating occupancy arrangements and access requirements with the Metro-North Engineer.
   i. Reviewing the status of progress payment requests, change proposals and Change Orders, Submittals, and Requests for Information.
   j. Reviewing other outstanding issues.
   k. Providing current as-build drawings to the Metro-North Engineer for review.

F. Pre-installation Meetings
   1. Internally coordinate the Work by scheduling and conducting pre- installation meetings that include the Contractor's employees, Subcontractors, Suppliers, manufacturers, and fabricators as attendees.
      a. The Metro-North Engineer may also require that the Contractor, his Subcontractor(s), and/or others to attend meetings held to discuss selective items of Work.
   2. For each activity affecting proper sequencing of the Work, schedule and conduct pre-installation meetings.
      a. Schedule the pre-installation meetings with your employees, Subcontractors, Suppliers, manufacturers, fabricators, and other affected parties as appropriate.
      b. Hold pre-installation meetings for Contract activities according to the early start dates for the activities established in the approved Contract Schedules required

under Section 01 32 00, Construction Progress Documentation, and well in advance of the submittal dates for related Shop Drawings so the activity is not delayed.

1) Prepare all documentation and procedures in advance for presentation at the meeting; including but not limited to, copies of drawings and Contract Drawings, Specifications, submittals, certifications, inspection and test procedures, and other pertinent documentation for use during the meeting.

c. Coordinate the work of your own employees, Subcontractors, Suppliers, manufacturers, fabricators, and other affected trades.

3. The Metro-North Engineer may also require that a pre-installation conference be held with the Contractor and it's Subcontractor(s) on selective items of Work.

G. Progress Schedule Update Meetings:

1. Unless otherwise directed, the Metro-North Engineer will hold monthly Progress Schedule Update Meetings to be attended by the Construction
2. Manager, the Contractor, and applicable Subcontractors as required.
3. The agenda of the Progress Schedule Update Meetings will, at a minimum, include a joint review of an agreement on the amount of progress made on the Work of the Contract and the update of the Schedule of Value quantities as shown in the draft Progress Schedule Update Reports.
4. After agreement is reached concerning the amount of progress made on the Work of the Contract and updated quantities, submit the Progress Schedule Update Report and the progressed Schedule of Values which then serves as the progress Payment Request.

H. Other Meetings:

1. In addition to the regularly scheduled meetings, ad-hoc meetings may be called to address significant matters or situations that have a bearing on the successful execution of the Work.
2. On an as needed basis, meetings may be called to discuss issues with representatives of local jurisdictions, public involvement representatives and news reporters, or other agencies involved with the Contract.

1.8 ELECTRONIC COMMUNICATION PROTOCOLS:

A. Electronic communications protocols for the Project are specified in the individual Specification Sections.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and other Division 01 Specification Sections, apply to the Work of this Section.

1.2 RELATED SECTIONS

A. Section 01 31 00 - Project Management and Coordination.

B. Section 01 33 00 - Submittal Procedures.

C. Section 01 71 00 - Examination and Preparation.

1.3 SUMMARY

A. This Section specifies requirements for
   1. Adequate planning, scheduling, managing, and executing the Work.
   2. Preliminary 90-Day Schedule.
   3. Contract Schedule.
   4. Monthly Update Reports.
   5. As-Built Schedule.
   6. Obtaining Contract time adjustments.
   7. Requirements for photographing and videotaping existing conditions prior to beginning construction activities.
   8. Requirements for providing pre-construction and new construction photographs of the construction as directed by the Construction Manager.
   9. Camera requirements.

1.4 REFERENCES

A. Abbreviations and Acronyms:
   1. CPM: An acronym referring to the Critical Path Method of construction scheduling wherein any delay to an activity on the critical path will result in a delay to the Project.

B. Definitions:
   1. Activities: Discrete items of Work that must be accomplished under the Contract, and when complete, produce definable, recognizable entities or stages within the Project.
   2. Day: Calendar days unless specifically noted otherwise.
   3. Float: The number of Days by which an activity can be delayed without lengthening the Critical Path and extend the Substantial Completion date.

4. Fragnet: Short for “fragment of a network”, and consisting of a set of activities copied from a portion of an existing project schedule that are saved and applied elsewhere within the same or another project schedule, or that are modified and re-applied to the schedule from which the fragnet was copied in order to modify the schedule.
5. Contract Milestone: A principal event specified in the Contract Documents relating to an intermediate or final completion date or time.
6. Project Schedule: The Preliminary 90-Day Schedule, Contract Construction Schedule, Monthly Status Reports, and any subsequent revisions to the Contract Construction Schedule as described below are collectively referred to as the Project Schedule.
7. Working Day: A day when work is be performed.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preconstruction Conference and Pre-Installation Meetings:
   1. Pre-Construction Conference:
      a. Attend the Pre-Construction Conference as required by Section 01 31 00, Project Management and Coordination.
   2. Pre-Installation Meetings:
      a. As required to properly coordinate and schedule particularly complex and/or sensitive installations, arrange pre-installation meetings with the affected Subcontractors and other affected entities, such as utilities, railroads, or the New York State Department of Transportation (NYSDOT), to discuss special scheduling requirements of those entities before beginning the work of their trades or working on their right-of-way and property, and schedule the Work appropriately.

B. Qualifications:
   1. Photographer’s Qualifications:
      a. Employ a photographer who is a professional photographer with previous experience providing construction photography, and who is acceptable to the Construction Manager.
      b. Submit the photographer’s qualifications including the name and documented qualifications of the proposed commercial photographer, and a list of previous assignments, to the Construction Manager for approval.

1.6 SUBMITTALS

A. Action Submittals:
   1. Submit the following to the Construction Manager for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
      a. Special Procedure Submittals:
         1) Contract Schedule.
         2) Monthly Update Reports.
            a) Draft Monthly Update Reports.
            b) Final Monthly Update Reports.
         3) Contractor’s proposed revisions to the accepted Contract Schedule.
         4) Proof construction photographs.
         5) Electronic digital copies of photographs.
         6) Select construction photographs.
         7) Pre-construction video discs.

b. Qualification Statements:
1) Photographer's qualifications.

1.7 EXISTING CONDITIONS

A. Preconstruction Photographs and Videos;
1. Prior to start of construction operations; photographically document Site conditions at each station.
a. Preconstruction Photographs:
1) Take aerial photographs.
2) Take a sufficient number of views to show existing conditions adjacent to the property before starting the Work.
b. Preconstruction Videos:
1) Record digital video of the pre-existing conditions at the Site and surrounding properties from different points of view.
2) Take video of existing improvements adjoining the property in sufficient detail to accurately record the physical conditions at the start of construction.
3) The Construction Manager will also select a number of items of special interest within the limits of the Site to be videotaped in detail.
4) With the video, provide a narrative describing the areas being videotaped and recorded, and the vantage point and direction of view.
c. Submit 2 sets of the discs of the digitally recorded preconstruction video to the Construction Manager for approval.
1) Record and submit the video on CD-R or DVD-R recordable discs.
2) Use a video format compatible with the latest release of Windows media.
2. Do not begin construction activity until the submitted photographs and video has been approved.

PART 2 - PRODUCTS

2.1 CAMERA EQUIPMENT

A. Color Digital Camera:
1. Furnish a color digital camera having a capacity of at least 20 megapixels.

B. Color Digital Video Camcorder:
1. Furnish a color digital video camcorder having a resolution at least equal to that of the digital camera specified in Subparagraph 2.1.A, and using digital video media capable of being used to produce still photographs.

PART 3 - EXECUTION

3.1 SURVEY AND LAYOUT DATA

A. Furnish and document survey and layout data as specified in Section 01 71 00, Examination and Preparation.

3.2 PROGRESS PHOTOGRAPHS AND VIDEOS

A. Refer to Progress Photographs requirements in the Terms and Conditions of the Contract.

B. Construction Videos:
   1. Prior to commencing construction, videotape the general worksite to record existing features and conditions of the surrounding environment as specified in Paragraph 1.6.A.
   2. The Construction Manager may require additional videotaping of construction Milestones during the course of construction, including the following:
      a. Start of construction including clearing, grubbing, and demolition operations as applicable.
      b. Highlights of the final inspection, including aerial photos, and acceptance of the Work by the Metro-North.
   3. Label the video cassettes with the following information:
      a. Name of the photographer
      b. Date the video was taken
      c. Contract number and title
      d. Subject of the video
      e. Location of the video
   4. Include a complete, clearly spoken narration of evens being photographed and an unobtrusive time and date indicator on the video recordings that accurately depicts the time and date when the videos were taken.
      a. Begin the narrative by giving the information required by Subparagraph 3.2.D.3.
   5. Digital Copies:
      a. Submit electronic digital copies of construction videos to the Construction Manager on digital media as directed and approved by the Construction Manager.

END OF SECTION

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and other Division 01 Specification Sections, apply to the Work of this Section.

1.2 RELATED SECTIONS

1.3 SUMMARY

A. This Section specifies:
   1. Requirements and procedures for submitting information to the Construction Manager for review, information, approval, or facilitating Project Closeout.
   2. Requirements for a Master Submittal Schedule, a Cost Breakdown Schedule, and Color Schedules.

1.4 REFERENCES

A. Abbreviations and Acronyms:
   1. MSDS: Material safety data sheets.

B. Definitions:
   1. Action Submittals: A category of submissions requiring responsive action by the Construction Manager that includes Product Data, Shop Drawings, Samples, Certificates, delegated design submittals, sustainable design submittals, special procedure submittals, and qualification statements.
   2. Certificates: Contractor or manufacturer prepared written instruments certifying that products comply with the requirements of the Project Manual and Contract Drawings, or certification of the qualifications of individuals and organizations.
   3. Closeout Submittals: A category of submissions required during project closeout that are subject to procedures specified by Metro-North, and that includes maintenance contracts, operation and maintenance data, bonds, warranty documentation, record documentation, sustainable design closeout documentation, and software.
   4. Design Calculations: Engineering, mathematical, or scientific computations as required to determine or prove the correctness of a proposed solution to a design issue.
   5. Informational Submittals: A category of submissions that do not require responsive action by the Construction Manager that includes test and evaluation reports, manufacturer's instructions, source and site quality control submittals, and manufacturer's reports.
   6. Maintenance Material Submittals: A category of submissions that do not require responsive action by the Construction Manager other than confirmation of receipt at the specified location, and that includes spare parts, extra stock materials, and tools.

7. Product Data: Product descriptive literature; product specifications, sizes, types, dimensions, and weights; product performance curves and capacity rating schedules; published details; the product manufacturer's name, trade names, and model numbers; information regarding product components, their arrangement, and accessories; installation instructions for the product or system; and product utility requirements for wiring, piping, service connection data, and motor sizes complete with electrical characteristics.
8. Samples: Physical specimens of products and systems prepared and delivered, or erected, by the Contractor or manufacturer as requested in the various Specifications Sections.
9. Shop Drawings: Detail drawings prepared by the Contractor, Subcontractors, or manufacturers, and that depict the products to be installed as part of the Work.
10. Submittals: Calculations, certificates, color schedules, Product Data, photographs, Samples, schedules, Shop Drawings, manuals, test reports, Working Drawings, and other similar information submitted to the Construction Manager for review and approval.
11. Technical Data: Plans that are required to be prepared, or studies required to be performed, as a part of the Work of this Contract and as additional engineering, mathematical, or scientific information regarding various aspects of a product's design or performance.
12. Test Reports: Reports, generally originating from an independent testing agency, that state or verify the results of required testing, and that often include some analysis of those results.
13. Working Drawings: Contractor prepared detail drawings that depict the Contractor's plan for temporary equipment or structures and other such work as may be required for construction, but which does not become an integral part of the completed Work.

C. Reference Standards:
1. American Institute of Architects/Construction Specifications Institute/National Institute of Building Sciences (AIA/CSI/NIBS):
   a. United States National CAD Standard® (NCS).
2. American Society of Mechanical Engineers (ASME):
   a. ASME Y14.24 – Types and Applications of Engineering Drawings.
   b. ASME Y14.34 – Associated Lists.
   c. ASME Y14.35M – Revision of Engineering Drawings and Associated Documents.
   d. ASME Y14.100 – Engineering Drawing Practices.
3. Instrument Society of America (ISA)

   a. ANSI/ISA-5.1 - Instrumentation Symbols and Identification.
   b. ISA-5.2 - Binary Logic Diagrams for Process Operations.
   c. ISA-5.3 - Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic, and Computer Systems.
   d. ISA-5.4 - Instrument Loop Diagrams.
   e. ISA-5.5 - Graphic Symbols for Process Displays.
   f. ANSI/ISA-51.1 - Process Instrumentation Terminology.

1.5 SUBMITTALS

A. Submittal Types:
1. Product Data:
   a. Furnish the product manufacturer's descriptive literature and specifications, including such items as standard catalogs; brochures; diagrams; schedules; performance charts; illustrations; calculations; schematic drawings; bills of material, delivery tickets, batch tickets, catalog cut sheets; capacity rating schedules; details;

lists of previous installations; published installation, erection, application, and placing instructions; material safety data sheets (MSDS), and other descriptive data related to the Work of the Contract.

1) Modify manufacturer's standard information to delete information which is not applicable to the work of the Contract and supplement the standard information with additional information applicable to this Contract.

2. Shop Drawings:

a. If Shop Drawings are specified, furnish completely dimensioned and annotated information regarding the submitted product or system, which typically includes information such as the following:

1) Material and construction details.
2) Fabrication drawings.
3) Layout and setting drawings and erection diagrams as necessary to illustrate the assembly or installation of various elements of the Work, such as anchor bolt layouts.
4) Locations and details of service and systems connections, including utility and electrical characteristics, utility connection requirements, and the location of utility outlets for functional equipment and appliances.
5) Schematic diagrams, such as electrical wiring diagrams or pneumatic schematics.
6) Weights of principal parts and completely assembled items.
7) Ratings, such as the rated horsepower of motors or gear and bearing ratings.
8) Service factors for equipment.
9) Plans, details, and elevation views to identify and clarify the relationships between items, such as piping layouts or face- mounted and internally-mounted components of control panels.
10) Process and instrumentation diagrams employing symbols and nomenclature that are in accordance with ANSI/ISA-5.1, ISA-5.2, ISA-5.3, ISA-5.4, ISA-5.5, and ANSI/ISA-51.1 to identify control system functions and components.
11) If appropriate, indicate the relation of submitted items to adjacent structures or materials.
    a) If appropriate, include field dimensions and clearly identify them as such.
    b) Verify field measurements, and coordinate with pertinent drawings from other contracts where applicable.

b. Working Drawings:

1) For temporary items as may be required for construction, furnish completely dimensioned and annotated drawings and associated calculations which typically include information for items such as the following:
    a) Temporary decking.
    b) Temporary bulkheads.
    c) Support of excavation.
    d) Support of utilities.
    e) Ground water controls.
    f) Forming and falsework.
2) Identify calculations by reference to the Working Drawing to which the calculations pertain.
3) Where appropriate, have a Registered Architect or Professional Engineer licensed in an appropriate discipline for the submitted working drawings and calculations sign and seal the drawings.

3. Samples, Color Schedules, and Mock-Ups:

a. Furnish Samples and mock-ups that illustrate functional and aesthetic characteristics similar in every way to the actual materials or equipment to be incorporated into the Work, and do not incorporate the Sample or mock-up material or equipment into the Work until approval to do so is received from the Construction Manager.
   1) Furnish required Samples and mock ups at no additional cost to the Owner.
b. Furnish office Samples of sizes and quantities that clearly illustrate the full color range and functional characteristics of products and materials, including attachment devices.
c. Send duplicate copies of transmittal letters for Sample submittals under separate cover and enclose a copy of the transmittal letter with the shipment of the Sample.
d. Erect field Samples and mock-ups at the Site as specified in individual Specification Sections, and as may be necessitated by the Contractor submitting value engineering proposals, at locations acceptable to the Construction Manager.
e. Color Schedules:
   1) Furnish color selection charts and samples that show all color options available for the products and systems specifying color schedule submissions.

4. Certificates:
   a. Furnish Certificates of Compliance and Certified Material Test Reports as specified.
      1) For those products for which no Product Data, Shop Drawings, Samples or test reports are specified or required, and for other items requiring these documents, furnish certificates that certify that the products comply with the requirements of the Contract.
      2) Include a copy of each certificate with the product for which the certificate is prepared.
   b. If the qualifications of individuals and organizations for performing some portion of the work are specified, furnish certificates authenticating the qualifications of these individuals and organizations for performing the work indicated for them.
   c. Ensure that the Construction Manager receives certificates no later than 30 Days before the product so certified is to be installed or the service is to be performed.
5. Design Submittals:
   a. Refer to the Contract Terms and Conditions for requirements.
6. Special Procedure Submittals:
   a. If special plans, phasing, or other special procedures are required to be submitted by the Specifications, furnish submittals complying with the special requirements specified for the submittal in the individual Specification Sections.
7. Qualification Statements:
   a. Provide qualification statements from applicators, fabricators, erectors, and installers that provide information, such as descriptions of their experience, lists of past projects, references, resumes, certifications, or certifications, as specified to prove that individuals or entities are qualified and capable of performing the Work they will be assigned under the Contract.
8. Test and Evaluation Reports:
   a. Test Reports:
      1) Furnish certified test reports of required tests, that state, verify, and analyze the results of the testing performed by an independent testing agency, and that demonstrate proof of compliance of the tested items with the Contract requirements.
   b. Evaluation Reports:
      1) Furnish evaluation reports from model code-writing organizations indicating the compliance of building materials and products with the model code.
9. Manufacturer's Instructions:

a. Furnish the manufacturer-prepared published or written instructions required to document the manufacturer's installation, erection, application, adjusting, testing, storage, maintenance, and other instructions for information as specified.

10. Manufacturer's Reports:
    a. Furnish the manufacturer's field reports documenting the testing and verification actions taken by the manufacturer's representatives to verify compliance with the manufacturer's standards or instructions.
11. Maintenance Contracts:
    a. Furnish maintenance contracts for the items indicated, for the durations specified, and having the scope required by the Contract Documents.
12. Operation and Maintenance Data:
    a. Operation and Maintenance (O&M) Manuals:
        1) Furnish Operation and Maintenance (O&M) Manuals in accordance with the requirements of Metro-North.
13. Bond and Warranty Documentation:
    a. Furnish bonds and sample warranties requiring approval by the Construction Manager and furnish final executed warranties for review of their accuracy as specified by Metro-North.
14. Record Documentation:
    a. Record documents include Shop Drawings, record drawings and specifications, addenda, Change Orders, Field Orders, photographs, and videotapes.
    b. Photographs and Videotapes:
        1) Furnish photographs and videotapes in accordance with the requirements of Section 01 32 00, Construction Progress Documentation, and other Sections as required.
    c. As-built Documentation:
        1) Furnish as-built documentation recording the actually constructed Work in accordance with the requirements of Metro-North, as required.
15. Software:
    a. Furnish computer software, including backup copies when required, and program documentation to allow the Owner to operate the computerized systems as specified.

B. Submittal Format:
1. Physical Form of Submittals:
    a. Whenever possible, submit information electronically.
        1) When the nature of the submittal is not conducive to being submitted electronically, such as material Samples, spare parts, or warranties, submit the physical item to the Construction Manager or other entity as required herein.
    b. Markings made on submittals by the Contractor or by his suppliers or manufacturers, whether written or otherwise, must be in a color other than red.
        1) Red is reserved for the exclusive use of the Construction Manager in marking Submittals.
    c. Prepare drawings and record documents to a high standard of quality, such as that set forth in the United States National CAD Standard (NCS), the ANSI Y14 Series, and/or other approved lower tier specifications defining equal drafting quality.
    d. Furnish printed submittal information in the form of high resolution, letter quality originals or photocopies marked to identify the submittal and to indicate which information is specific to this Contract.
        1) Furnish submittal pages and sheets sized 8-1/2 by 11 inches, or if larger, folded to 8-1/2 by 11 inches size so that any title blocks are clearly visible without one having to unfold the sheet.

2) Unless otherwise stated in the Contract Documents, furnish submittal drawings of similar size and scale as the plan sheets prepared and offered for sale to potential bidders, or a sheet provided on a different size media and using a proportional scale.
   a) Fold submittal drawings similarly to printed submittal information and insert them in binder pockets as appropriate.
3) Bind each set of printed submittal information in hard cover, loose- leaf, 3-ring or 19-ring binders.
   a) Provide binders that allow a minimum ring space of 1/2-inch when closed to facilitate opening and closing the binder, and accessing and removing any sheet in the binder as necessary.
   b) Provide a table of contents for each binder.

e. For Samples, such as physical specimens of pipe railing or roofing material, provide appropriate packing, specimens, and quantities to demonstrate clearly the nature of the item.

f. Electronic Media Submittals:
1) For submittals prepared on electronic media, furnish compact discs (CDs) containing a copy of the submittal data.
2) For documents submitted on electronic media, format the documents using software compatible with Microsoft Word 2013™, Microsoft Excel 2013™, and AutoCAD 2011©.
3) For software submittals on electronic media, furnish submittals formatted to use the software originator's standard operating system.
   a) Microsoft Windows© is the preferred operating system if it is an option and is compatible with the product associated with the software.

g. For submittal format requirements regarding Operation and Maintenance (O&M) Manuals, comply with the requirements specified by Metro-North.

2. Submittal Identification:
a. Contract Identification Information:
1) Identify each submittal individually by permanently adhering the following Contract identification information, as applicable, to the submittal:
   a) Owner's name.
   b) Contract name.
   c) Owner's contract number.
   d) Contract location.

b. Submittal Numbering:
1) Uniquely identify each submittal by including a submittal identification number on the submittal developed as follows:
   a) For a submittal specified in a Specification Section or other document in the Project Manual, begin the unique number with a capital "S" prefix and the number of the Specification Section or other document in the Project Manual in which the submittal is specified.
      (1) For example, for a submittal specified by this Specification Section, the submittal number would begin with "S 01 33 00".
      (2) If an item is only defined on the Contract Drawings and not anywhere in the Specifications, substitute a capital "D" for the "S" prefix in the submittal number and use the Contract Drawing number in lieu of the Specification Section number.
         a. For example, a submittal for electrical equipment appearing only on Contract Drawing E-140 would begin with "D E-140".

b) Next, add a hyphen and a sequential integer number for each subsequent submittal required within the Submittal Article of same Specification Section or other document in the Project Manual.
   (1) For example, the hyphenated number for a second required submittal within this Specification Section would be "-2**"**, and the modified number would become "S 01 33 00-2".
   (2) If an item is only defined on the Contract Drawings and not anywhere in the Specifications, the modified number for the second required submittal on the E-140 Contract Drawing would then be "D E-140-2".

c) To further differentiate various identifiable parts of a submittal, add two decimal places to the modified number to identify which part of the submittal is being indicated.
   (1) For example, to differentiate between a submittal number for a color selection chart for paint and coatings from a color selection chart for fiberglass, add ".01"to the number for the paint and coatings color selection chart to make it "S 01 33 00-8.01**",** and add ".02"to the number for the fiberglass color selection chart to make it "S 01 33 00-8.02".

d) To indicate whether a submittal is the initial submittal for an item or a re-submittal that is required because the previous submittal for the item was returned from the Construction Manager with a review status that requires a re-submittal, add sequential alphabet letters as a suffix to the submittal number to indicate which submittal in the sequence is being identified.
   (1) For example, if a previous submittal is not approved and must be resubmitted or additional information regarding the item must be provided, add an alphabetic suffix to the previous submittal number to index the suffix to the next letter of the alphabet and generate the submittal number for the re-submittal
      a. For example, if the initial submission of the second required submittal in this Section, submittal number S 01 33 00-2.00, must be resubmitted several times, the submittal number for the first re-submittal would be "S 01 33 00-2.00A", the submittal number for the second re-submittal would be "S 01 33 00-2.00B", and so forth.
      b. The submittal number for the resubmission of a submittal required only by a Contract Drawing is similarly revised; the submittal number for a re-submittal of submittal number D E-140-2.00 would be "D E-140-2.00A".

c. Identification of Products, Systems, and Services:
   1) Although the Specification Section or Contract Drawing number in which a product, system, or service is specified is part of the submittal number, the products, systems, or services within the Section or on the Contract Drawing need to be further identified to specifically show which particular item is being submitted and for what purpose it will be used as follows:
      a) Provide a brief written title or description, including such items as the model number, style number, serial number, or lot number, to clearly

and uniquely identify the product, system, Sample, or service submitted and describe where it is to be used or where it is to perform.

b) Indicate the Article, Paragraph, or Subparagraph references from Specification Sections and the Contract Drawing number or numbers, revision number or numbers, and the dates of the Contract Drawings or revisions to correlate the submitted products with the Contract Documents.

(1) Indicate the titles of details, sections, elevations, schedules, or other similar identifiers on the Contract Drawings that may help locate the source of the submittal.

c) Provide names, addresses, and phone numbers of the Contractor, Subcontractors, suppliers, vendors, manufacturers, and if applicable the seal and signature of a Professional Engineer currently registered in the State of New York for the involved discipline.

2) If catalogs, brochures, or catalog cut pages are submitted, provide each separate catalog, brochure, or single page with the identification required in Subparagraph 1.04.B.2.

a) If submitted catalogs or brochures contain multiple items for approval, identify each item separately.

(1) In this instance, include page and catalog item numbers as part of the product identification.

3) Identify all deviations from the Specifications and Contract Drawings on submittals.

d. Dates:

1) Indicate the date of the submittal and, if applicable, revision dates too.

e. Contractor's Certification Statement:

1) Verify that the Contractor's Certification Statement required by Paragraph 1.04.E is affixed to each submittal.

3. Space for Construction Manager's Stamp:

a. Provide a clear space approximately 3 inches high by 4 inches wide adjacent to the submittal identification information to receive the Construction Manager's stamp, on which the Construction Manager will indicate the status or disposition of the submittal following the Construction Manager's review.

C. Procedures for Submitting Information:

1. Unless specified otherwise, send submittals to the Construction Manager accompanied by a letter of transmittal that lists all items in the submittal:

a. If, because of standard shop practice or other reasons, submittals show variations from the Contract requirements, specifically identify these variations and the reasons for them in the letter of transmittal.

1) In the event the variations are acceptable to the Owner, suitable action will be taken to properly adjust the Contract.

2) In the event the variations are not accepted by the Owner, the Contractor is not relieved of the responsibility for executing the Work in accordance with the Contract even though the submittals showing the variations may have been approved.

b. Submit the required submittals promptly so delays in performing the Work of the Contract are avoided.

c. Supplemental submittals initiated by the Contractor for consideration of corrective procedures must contain sufficient data to allow the Construction Manager to make an informed review and decision.

2. Number of Copies to Submit:
   a. If the item is submitted electronically, only 1 "copy" needs to be submitted; if the nature of the item is not conducive to submittal electronically, follow the alternate requirements of Subparagraph 1.05.C.2.b.
   b. For each submittal, submit the number of copies of the information as indicated below for the appropriate type of submittal or re-submittal:
      1) For Product Data, certificates, design calculations, technical data, and test reports submit at least 6 copies of each item.
      2) For Shop Drawings and Working Drawings, submit at least 1 reproducible and 5 prints of each.
      3) For color selection charts and samples, submit 6 sets of each.
      4) For Samples, submit at least the number of Samples specified in the Section specifying the requirement for the Samples; or, if no number is indicated there, submit at least 2 non-returnable Samples.
      5) For submittal requirements regarding Contract closeout submittals, contact Metro-North.
      6) For submittal requirements regarding Operation and Maintenance (O&M) Manuals, contact Metro-North for details.
      7) For submittals returned with a RETURNED FOR CORRECTION disposition after review by the Construction Manager, re-submit a minimum of 6 corrected copies.
      8) For submittals returned with a NOT APPROVED disposition after review by the Construction Manager, submit at least 6 copies of completely new submittals that show the non-conformances responsible for the rejection of the previous submittal have been eliminated.
   c. Final Shop Drawings:
      1) Within 10 days after receipt of the Construction Manager's approval, submit 1 copy of each mylar reproducible in a mailing tube and 2 prints of final shop drawings to the Construction Manager.
         a) Mark each copy with the words "This drawing was approved by the Construction Manager on [*date*]."
         b) Include space on the reproducible for Metro-North's drawing numbers and title blocks.
         c) Folded mylar reproducible are unacceptable.

D. Review and Disposition of Submittals:
   1. Construction Manager's Review:
      a. Following receipt of a submittal from the Contractor, the Construction Manager will review the general content of the submittal for conformance to the requirements of the Contract Drawings and Specifications.
         1) Review and approval of submittals by the Construction Manager is only for conformance with the Contract's design concept and for compliance with the information given in the Contract Documents.
         2) The review and approval of a separate item does not indicate approval of an assembly in which the item functions.
         3) Review and approval of a submittal by the Construction Manager does not relieve the Contractor of his responsibility for the accuracy of the submittal, for conformity of the submittal to the requirements of the Contract Drawings and Specifications, for compatibility of the described product with contiguous products and the rest of the system, for proper fit, or for completion of the Contract in accordance with the Contract Drawings and Specifications.

a) The Contractor is responsible for providing materials and work required by the Contract that may not have been indicated on the submittal when it was approved.
b) The Construction Manager is not responsible for coordinating submittal information, such as the size and location of equipment; openings for piping, ducts and conduits; locations and sizes of concrete pads and anchor bolts; and similar Contract interfaces.

b. The Construction Manager's review and approval of submittals does not extend to the means, methods, techniques, sequences, or procedures of construction except where a specific means, method, technique, sequence, or procedure of construction is indicated in or required by the Contract Documents, or to facilitate mandated safety precautions or programs incident thereto.

c. Where a submittal pertinent to some part of the Work is required by the Specifications, and the part of the work related to that submittal is performed prior to the Construction Manager's review and approval of the submittal, such work is performed at the Contractor's risk and is the sole responsibility of the Contractor.

2. Construction Manager's Disposition of Submittals:

a. After review by the Construction Manager, submittals will be returned marked with one of the following Review Status dispositions:

1) APPROVED:
a) When submittals are returned with an APPROVED disposition, it is understood that the submittals have been found to be in conformance with the Contract Documents.
b) Approval by the Construction Manager of submittals does not relieve the Contractor from responsibility for errors or discrepancies in such submittals or for compliance with the Contract Documents; neither does it relieve the Design- Builder of the responsibility for providing adequate quality control measures nor relieve the Contractor of the responsibility for providing proper and sufficient materials, equipment, and labor to complete the approved Work in accordance with the Contract Documents.

2) APPROVED WITH CHANGES NOTED:
a) When submittals are returned APPROVED WITH CHANGES NOTED disposition, it is understood that the submittals have been found to be in conformance with the Contract Documents, provided the changes noted by the Construction Manager are incorporated into the submittals.
b) Submittals returned with an APPROVED WITH CHANGES NOTED disposition do not require resubmission of the corrected information.

3) RETURNED FOR CORRECTION:
a) When submittals are returned noted with a RETURNED FOR CORRECTION disposition, it is understood that the Design- Builder must make the required corrections and resubmit corrected submittals to the Construction Manager before the submittal can be approved.

4) NOT APPROVED:
a) When submittals are returned with a NOT APPROVED disposition, it is understood that the Contractor must prepare completely new submittals and resubmit these submittals to the Construction Manager for approval before the item can be approved.

b. Unless otherwise stated in the Contract Documents, do not commence any portion of the Work requiring approval of submittals until these submissions have been approved by the Construction Manager.
   1) Should, for any reason, the Contract not be awarded, the Design- Builder will not be entitled to reimbursement for work performed prior to the Contract award.
   2) Subsequent to award of the Contract, the Contractor will not be entitled to reimbursement for changes to submittals made necessary due to changes made to the Contract Documents unless the changes to the Contract Documents occur after approval of the submissions.

c. Unless otherwise stated in the Contract documents, review of submittals will begin only after the submission of a complete set of information required to complete a discrete item of work.
   1) The review process will allow 2 work days for each drawing submitted or a minimum of 10 days, unless stated otherwise in the Contract Documents.
   2) Do not submit materials directly to a reviewing unit unless prior approval of the Construction Manager is obtained.
   3) Furnish complete copies of all submissions to the Construction Manager.

3. Number of Copies Returned to the Contractor:
   a. Whenever possible, the Construction Manager will return 1 “copy” of submittal dispositions electronically.
      1) When the nature of the submittal is not conducive to being returned electronically, such as material Samples, the physical item will be returned as otherwise specified herein.
   b. When it is not possible to return submittal dispositions electronically the Construction Manager will return at least 2 copies of reviewed submittals to the Contractor under the following conditions or provisos:
      1) If more than 2 reviewed copies are required, submit an additional number of copies above the number normally required equal to the additional number of copies desired be submitted to the Construction Manager.
         a) Provide additional copies of prints from reproducibles, catalog cut sheets, and other types of submittals if needed for distribution to suppliers or Subcontractors.
         b) The Construction Manager is responsible for providing copies to the field engineers, inspectors, and the Owner from the normally required copies.
      2) For submittals that require a reproducible to be submitted, the approved or corrected reproducible will be returned to the Design- Builder.
      3) For construction progress documentation submittals, refer to Section 01 32 00, Construction Progress Documentation, regarding the number of copies returned.
      4) For Operation and Maintenance (O&M) Manual submittals, contact Metro-North, regarding the number of copies returned.

4. Re-submittal Requirements:
   a. Amend and resubmit all submittals that are not approved by the Construction Manager.
      1) Following receipt of submittals with an Construction Manager’s Review Status disposition that requires a resubmission of the product, make the corrections to the submittals as required by the Construction Manager and return the number of copies of the corrected submittal information that are as

specified in Subparagraph 1.04.C.2 as applicable, and submit new Samples as required, for review and approval.

b. Direct the attention of the reviewer to revisions, other than the corrections required by the Construction Manager on previous submittals, by specifically annotating them in writing.

5. Closeout Submittals:
   a. At Project Closeout, make submittals in accordance with the procedures as required by Metro-North.

E. Contractor's Certification Statements:
   1. Prior to formally sending each submittal to the Construction Manager for approval, perform the following checks and reviews:
      a. Verify the materials, dimensions, catalog numbers, shop fits, field connections, related field measurements and field construction criteria, product availability in the quantities that are required, and similar data.
      b. Review information that is available that has a direct effect on the products being submitted.
         1) Check and coordinate each item with applicable, approved submittals from this Contract and, if applicable, from other related contracts and subcontracts.
         2) Review the submittal information for accuracy, completeness, and compliance with the Contract requirements.
         3) Review the submittal information for compatibility with the work of affected trades and subcontracts.
      c. After performing the above checks and reviews, affix the following signed Certification Statement to each submittal to certify that the Contractor has checked the information contained in the submittal and found it to be satisfactory for meeting the requirements of the Contract Documents, and further that there will be no difficulty in erecting or installing the submitted items or completing the Contract as agreed:

         "By this submittal, I hereby represent that I have determined and verified field measurements, field construction criteria, materials, dimensions, catalog numbers, and similar data; and I have checked and coordinated each item with the Contract Drawings, Specifications, other applicable approved Shop Drawings, and Contract requirements."

      d. Failure of the Contractor to note his approval on a submittal is reason for the Construction Manager to return such submission to the Contractor un-reviewed.
      e. If submittals appear not to have been properly checked by the Design- Builder even though the Contractor's approval has been noted thereon, the submittal will be returned to the Contractor un- reviewed.

F. Master Submittal List:
   1. Submit the following information to the Construction Manager for approval in accordance with the requirements of this Section:
      a. Master Submittal List
         1) Within 30 Days after the award of the Contract, submit a Master Submittal List of proposed submittals to the Construction Manager for approval.
            a) Indicate the submittal number for each submittal in accordance with Subparagraph 1.04.B.2.b and identify the products, systems, or services submitted in accordance with Subparagraph 1.04B.2.c.

b) Indicate the proposed date of each submission, and the quantity or number of copies for the various types of submittals, in this list.
c) Assign the submission dates in a sequence that is in accord with the importance of the Work to the progress of construction.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SITE QUALITY CONTROL

A. Mandatory Submittal File:
1. Maintain a submittal file in the project field office that contains all current, up-to-date submittals.

B. Conforming Work to Approved Submittals:
1. Contract Work, materials, fabrication, and installation must conform to approved Contract submittals.
a. Do not allow any portion of work requiring an approved submittal to be started or materials to be fabricated or installed prior to receiving approval or qualified approval of the item.
b. Do not make changes to approved submittals unless those changes have been accepted and approved in writing by the Construction Manager.
c. Distribute approved submittals to Subcontractors and, if applicable, other Contractors to make product information available for identifying and correcting conflicts before they adversely affect construction.
1) Should conflicts occur, first obtain the Construction Manager's approval of necessary revisions and adjustments to eliminate the conflicts, and then perform the revisions and adjustments to the work at no additional cost to the Owner.
2. Fabrication performed, materials purchased, or on-site construction accomplished that does not conform to approved submittals is at the Contractor's risk.
3. Rejection of any submittal required by this Section is not an acceptable basis for any claim for delay.
4. The Owner is not liable for expenses or delay due to corrections or remedies required to accomplish conformity.

END OF SECTION

SECTION 01 33 60
SAFETY, HEALTH, & ENVIRONMENTAL CONTROL

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SECTION 01 33 60
SAFETY, HEALTH, & ENVIRONMENTAL CONTROL

PART 1 - GENERAL

A. Safety and security of customers, passengers, Railroad employees, employees of the Contractor and its subcontractors, and other persons, as well as protection of property and the environment, shall be a primary responsibility and concern of the Contractor. Precautions shall be exercised at all times for the protection of person and property. The Contractor shall assume the full responsibility and obligation to provide a safe working environment at all times and shall maintain a safe, clean, and healthy worksite. The Contractor shall supply, install, and maintain all safety apparatus and equipment necessary to protect the welfare of his employees, the public, customers, and Railroad employees.

B. The Contractor shall comply with this specification section, Metro-North Railroad Operating Procedures and General Safety Instructions, and all applicable federal, State, and local laws, rules, regulations, codes, statutes, ordinances, and provisions including but not limited to, the Occupational Safety and Health Administration, the Federal Railroad Administration, the Environmental Protection Agency (Federal), New York State Department of Environmental Conservation (State), Department of Environmental Protection (City), the National Fire Protection Association (NFPA), the National Electrical Code, the New York State Industrial Code, the New York State Uniform Fire Prevention and Building Code, and requirements of the local municipality in which the Work is performed.

C. Notwithstanding any remedies for maintaining a safe, clean, secure and healthy work site, in the event that the Contractor's work environment chronically provides a site such that, there are significant safety or security concerns, this may constitute an Event of Default in accordance with Article 7.01 of the Contract Terms and Conditions.

D. PROJECT INCIDENCE RATES

1) Metro-North maintains a database of injuries occurring to Contractor employees, customers, and Railroad employees. Metro-North calculates Recordable and Lost Time injury incidence rates for comparison to the industry average rates maintained by the Bureau of Labor Statistics. These rates are updated monthly. Metro-North utilizes the industry classification of Specialty Trade Contractors (NAICS 238) for comparative analysis. The safety record of a project is based upon comparison of the calculated project incidence rate to the latest national average incident rate for Specialty trade Contractors.

2) Incidence rates are calculated utilizing the following formula. The Contractor shall review the project incidence rates with the work force during Worker Safety Meetings.

$$\text{Incidence Rate} = \frac{\text{Number of Recordable or Lost Time Injuries} \times \text{200,000 (100 workers x 40 hours x 50 weeks)}}{\text{Actual Hours Worked}}$$

(NOTE: Work hours are tallied from the WF-257 Work Force Utilization Reports submitted by the Contractor)

PART 2 - SAFETY & HEALTH REQUIREMENTS

2.01 EMPLOYEE CONDUCT & RESPONSIBILITY

A. The Contractor shall be responsible for the implementation and enforcement of safety and security rules and requirements.

B. To promote safety the Contractor shall hold regular safety meetings, ensure its and all Subcontractor employees are properly trained, and monitor job site safety via inspection at the start and completion of each shift as well as monitoring the job site for this purpose throughout the day. The Contractor shall correct and report any safety violations and convene investigative meetings, as directed by the Engineer.

C. Any Contractor personnel who in the Engineer's opinion violates or is not in conformance with the safety requirements may be prohibited from working on Railroad property. Metro-North will maintain records of such prohibitions and the individual will also be prohibited from working on all other Metro-North projects for the duration of this contract.

D. The Engineer reserves the right to refuse access to the Site or require immediate removal from the Site any individual violating, or alleged to have violated, site safety or security regulations and Contractor agrees to obtain consent of its subcontractors to a similar provision, and Contractor agrees to hold the Railroad harmless for taking such actions.

2.02 BAN AGAINST INTOXICANTS / FITNESS FOR DUTY - SAFE AND PROPER CONDUCT OF CONTRACTOR PERSONNEL

A. While on Metro-North property or otherwise performing work for the Contract employees and Consultants of the Contractor and its Subcontractors shall conduct themselves in a safe and businesslike manner, conducive to the safe and efficient operation of the Railroad. The Contractor shall meet the requirements of the Federal Railroad Association (FRA) 49 CFR 219 'Control of Alcohol and Drug Use' for regulated, Maintenance of Way and or Roadway Worker as defined by FRA. Questions regarding this FRA regulation are to be directed to the FRA, Drug and Alcohol Program Manager, Office of Safety Enforcement, Federal Railroad Administration in Washington DC.

B. The Contractor shall prohibit the possession and use of alcoholic beverages and intoxicants by all Contractor and Subcontractor personnel. Any Contractor or Subcontractor personnel determined by Metro-North, in its sole discretion, to be in violation of the provision, including but not limited to those determined by Metro-North to have violated the ban against intoxicants, will be prohibited from working on the Contract for its duration.

C. The Contractor shall not permit a worker whose ability or alertness is impaired because of drugs, fatigue, illness, intoxication, or other conditions to work at the Site. The Contractor shall ensure that its supervisory staff and the supervisory staff of each subcontractor perform a fitness for duty inspection on each worker reporting for work and throughout the day. The Contractor shall have a substance abuse program, pre-employment drug testing, and testing for cause.

2.03 METRO-NORTH CONTRACTOR SAFETY ORIENTATION

A. All contract personnel working on Metro-North Railroad (MNR) Property or on a MNR project are to complete the computer based training class entitled 'Metro-North Railroad Contractor Safety Training'. It is the Contractor's responsibility to schedule training and ensure workers complete the computer based training (CBT) prior to the start of work. Contractor personnel will not be permitted to commence work until they present documentation demonstrating each worker has completed the training. CBT cost will be at the Contractor's expense at an approximate cost of $25.00 per person [this fee is not paid to MNR and is subject to change without notice].

B. Once the Contractor's Supervisory Staff, Safety Engineer, Safety Supervisor, **Safety** Manager or other qualified management representative is on site they are required to attend a 'MNR Site Orientation' with an MNR Roadway Worker (MNR RW) prior to the commencement of work. The Contractor is then responsibility to provide 'Employee Site Safety Orientation'.

C. Documentation evidencing completion of the OSHA 10 hour or 30 hour Construction Safety course within five (5) years of the contract award date shall be provided as a prerequisite for attending Metro-North's Roadway Worker Procedures for Contract Employees Working on Metro-North Property or project. Workers to provide documentation of OSHA training at initial MNR site orientation.

D. The requirements covered by this training are a condition of working on Metro-North Railroad property, Project or Contract.

E. The training is valid for a period of one (1) year from the date of training. The training must be refreshed annually on or before the initial date of training. It is the Contractor's responsibility to ensure the training of its workforce is current and will be at the contractor's expense.

2.04 METRO-NORTH SPECIFIC SAFETY REQUIREMENTS

A. The Contractor is hereby notified that the Railroad contains hazards not typical of other construction sites, including but not limited to, moving rail equipment and hazardous energy (i.e Third Rail 750 volts DC, Overhead Catenary 12.5 kV to 25 kV AC). Employee awareness and management's vigilance are crucial to maintaining safety in this environment. The presence of a Metro-North Conductor-Flagman (if any) shall not relieve the Contractor of responsibility for taking all proper precautions, especially in the vicinity of tracks and high voltage electrical circuits.

B. Communication is paramount to safety, especially in the railroad environment. Where any language barrier exists with respect to other Contractor or Subcontractor employees, the Contractor will provide a qualified interpreter(s) who will be present whenever needed, in the opinion of the Engineer, to enforce safe conduct of the Work including but not limited to, at each work site and during meetings and safety classes. The Contractor shall provide at least one (1) individual that is fluent in the English language and able to communicate effectively with the Engineer and/or Conductor Flagman and translate between non-English speaking or comprehending individuals and the Engineer and/or Conductor Flagman. This individual must be able to effect communication between the work force and the Engineer and/or Conductor Flagman. Should the Engineer and/or Conductor

Flagman deem the communication ineffective, or has a potential to jeopardize the safety of the work force, the Engineer and/or Conductor Flagman has the right to stop the work until the Contractor can provide effective communication, the cost of any resulting delays to be borne by the Contractor.

C. Mobile telephones and other electronic devices shall not be used while on or about the tracks, and/or while operating machinery or equipment. Mobile telephones and other electronic devices may not be used while in areas of risk, such as on ladders, or while actively engaged in the work. Refer to General Safety Instruction 300.3 and Operating Rule D6 for specific requirements.

D. Audio devices such as radios, stereos, personal music players, or other audible devices are prohibited from use on Metro-North property. This includes audio devices within construction equipment.

E. All ladders shall meet or exceed OSHA requirements. Commercially available ladders used during the work shall be limited to those of fiberglass construction. Job site constructed ladders may be of wood construction.

F. All stairways and passageways shall be maintained free of obstructions unless G. specifically necessitated by the work and approved by the Engineer.

G. Eyewash stations shall be provided, maintained, and readily accessible at all construction sites regardless of the presence or use of corrosive materials. Large sites, or projects having remote work locations, shall have additional eyewash stations as necessary.

H. Should know or suspect hazardous materials be unearthed, uncovered, or otherwise discovered during the course of the work, the work in that area shall cease and the Engineer shall be immediately notified. Work impacting the known or suspect hazardous material shall not resume without the direction of the Engineer.

I. All materials, whether to be used for temporary or permanent construction, shall be fire resistant or fire retardant treated. Materials shall have the manufacturers labeling evidencing such. Materials shall come from the manufacturer pretreated. Application of fire retardants on the project site is prohibited.

2.05 SPECIFIC REQUIREMENTS FOR WORK IN GRAND CENTRAL TERMINAL

A. The following requirements are specific to work being performed within Grand Central Terminal (GCT) from 42nd Street to 57th Street and Madison Avenue to Lexington Avenue.

B. The Contractor shall notify the Metro-North Project Manager and Construction Manager of their intent to work in GCT. At no time shall the Contractor enter GCT without the knowledge of the Metro-North Project Manager, Construction Manager, and Station Master's Office. The Contractor shall provide a schedule identifying the days, dates, shift times, locations of the work, and companies/subcontractors that will be on site.

C. The Contractor shall assign one individual the responsibility of Designated Emergency Contact. The Designated Emergency Contact (DEC) shall be an individual that is on site and at the location of the work activity. An alternate DEC shall be assigned whenever the

primary DEC is not on site. The DEC shall be responsible for implementation of the Emergency Action/Evacuation Plan if necessary. The DEC shall be familiar with the Emergency Action/Evacuation Plan, which includes the primary and alternate evacuation routes and GCT emergency numbers (i.e. Station Master's Office, Fire Command Center, Operations Command Center, MTA Police).

D. The Contractor shall include the following numbers in the Emergency Contact List for projects within GCT.

MTA Police	(212) 878-1001 (888) 682-9117 (888) MTA911PD
Security Command Center (SCC)	914 461-0525
Fire Command Center (FCC)	212 340-3191 /3192
Station Master's Office (SMO)	212 340-2583
Transportation Office (Track 25)	212 340-2325/2329
Operations Control Center (OCC)	212 340-2050 (800) 724-3004

E. The Contractor shall provide the following information to the Station Master's Office at the start of each work shift: the name and phone number(s) of the DEC, a list of names of all contractor personnel working within GCT, a description of the location of the work, the shift start and end times.

F. Equipment and materials shall only be stored in areas designated by GCT building management. Storage areas shall be kept neat and orderly, and free from accumulations of debris.

G. Passenger elevators shall not be used for the transportation of construction materials without the prior approval of GCT building management. Transport of construction equipment, tools, and materials via escalators is strictly prohibited.

H. Care shall be taken for the transportation or movement of construction equipment, tools, and materials via rolling dollies, pump jacks, or other wheeled equipment throughout GCT. Such are prohibited on ramps or other inclined surfaces unless adequate controls are implemented to prevent run-away of the wheeled equipment. Unless otherwise approved by GCT building management, transportation or movement of construction equipment, tools, and materials is limited to off hours.

I. All materials, whether to be used for temporary or permanent construction, shall be fire resistant, and when possible, non-combustible materials shall be chosen over combustible materials (i.e. steel framing instead of wood framing, gypsum board instead of plywood). Each temporary structure shall be constructed of fire resistant or fire retardant treated material. All materials (i.e. lumber, plywood) shall be fire retardant treated and contain the manufacturer's stamps evidencing such. If the stamps are illegible or otherwise not

provided, the material shall be immediately removed from the premises and replaced at no additional expense to Metro-North. On site application of fire retardants by the Contractor is prohibited, except when the material is not commercially available pretreated from the manufacturer.

J. Temporary barriers used to segregate work areas from non-work areas shall be constructed as to provide a two (2) hour fire rating.

K. The storage of flammable materials within GCT shall be pre-approved by the Metro-North Office of Fire Prevention in Grand Central Terminal. Flammable materials shall be stored in approved containers in accordance with NFPA and FDNY guidelines and requirements. Flammable materials that will be stored on site shall be stored in approved containers, within flammable storage cabinets, located in areas equipped with fire suppression.

2.06 SAFETY SUBMITTALS

A. The Contractor shall provide the following submittals:

1) Safety, Health, and Environmental Control Plan (SHECP) [reviewed at a minimum annually]
2) Emergency Contact List [to be up dated at a minimum quarterly]
3) Subcontractor's Notice of Intent to Comply with Project SHECP
4) Record of Metro-North Roadway Worker Safety Training [submit records monthly]
5) Record of Employee Safety Orientation
6) Safe Work Plans [To be done for each Task]
7) Daily Safety Reports
8) Monthly Site Safety Audit Reports
9) Resumes & Qualifications of Safety Engineer and Safety Supervisor
10) Forms and reports for the documentation and investigation of Incidents, Accidents, and Injuries
11) Record of Employee Safety Meeting (i.e. Tool Box Meetings)
12) Evidence of Employee Training (i.e. OSHA 10 hr Construction Safety, Fall Protection, Confined Space Entry & Attendant, Scaffold Erection & User)
13) Fall Protection Plan
14) Safety Data Sheets (SDS)
15) Employee Roster / Daily Employee Sign In/Sign Out Log
16) Crane, Lifting Equipment, Rigging, Hoisting Plan
17) Copies of Citations, Suits, or Complaints

2.07 SAFETY KICKOFF MEETING

A. The Contractor's Project Manager, Safety Engineer, and Safety Supervisor(s) shall attend a Safety Kickoff Meeting which will be convened by the Engineer within 45 calendar days of Award.

2.08 SAFETY, HEALTH, AND ENVIRONMENTAL CONTROL PLAN (SHECP)

A. The Contractor shall develop and maintain a written, Contract specific, Safety, Health, and Environmental Control Plan (SHECP) to:

- Protect the lives and health of all persons,
- Provide employees with information to enable them to work safely
- Prevent damage to property and environment
- Identify hazardous conditions and unsafe work practices
- Provide a system for auditing work site safety and compliance with the established safety program
- Avoid work interruptions or any delay to train services due to accidents

B. Within fifteen (15) days of the date of Award, the Contractor shall submit the SHECP to the Railroad. Work on the Site shall not be permitted to start until the full written plan, covering all required items, has been submitted and accepted, and Safe Work Plans (SWPs) for the upcoming construction activities meeting the requirements of Section 2.16 are submitted, reviewed, and revised accordingly.

C. The Safety Engineer shall be involved in the preparation and review of the SHECP as evidenced by their signature on the cover page of the document.

D. Failure of the SHECP to address the safety concerns specific to the contract and its scope of work, and contain the information required by this section, shall be grounds for immediate rejection of the submittal

E. The ***Contractor shall utilize the provided SHECP Checklist*** to prepare the SHECP. The Contractor shall complete the SHECP Checklist and attach it to the SHECP upon submittal. Failure of the SHECP submittal to contain a completed SHECP checklist shall be grounds for rejection of the submittal.

F. The SHECP shall be a written plan laying out the management organization and strategy to assure high levels of job site safety for all performed tasks. It shall define the personnel responsible for developing and assuring safe work practices for each major item of work or subcontract.

G. The Contractor shall revise and resubmit the SHECP based upon comments returned from the Engineer. As to facilitate the SHECP review process, should comments be returned to the Contractor, the Contractor shall address each comment individually and separately from revisions to the SHECP itself. ***A cover letter identifying each of the reviewer's comments and the Contractor's responses shall accompany the revised and resubmitted SHECP.***

H. The Contractor shall take immediate action to prevent the recurrence of each incident, accident, or injury. In addition, the Contractor shall review the SHECP based on such an occurrence and revise as necessary. Upon any changes in work conditions, the Contractor

shall also revise the SHECP. The Contractor shall submit each revision of the SHECP to the Engineer for review.

I. The Contractor shall maintain a copy of the SHECP within the project field office. The Contractor's SHECP including each ***Subcontractor's Notice of Intent to Comply*** with the Contractor's SHECP shall be readily available for review by the Railroad.

J. The Contractor shall ensure that all Subcontractors and Suppliers comply with the Contractor's SHECP, or submit their own programs that the Contractor shall be required to approve. Each subcontractor shall comply with the Contractor's SHECP, and shall ***provide written notification of its intent to adopt and comply with the Contractor's SHECP***. If the Subcontractor elects to submit its own SHECP, it shall demonstrate that their program meets the requirements of this Section, be approved by the Safety Engineer, and be incorporated into the Contractor's SHECP. The Subcontractor's SHECP shall be submitted and approved prior to the start of the Subcontractor's work on the Site. The Contractor shall review the Subcontractor's and Supplier's agreements to ensure the flow down of all applicable safety requirements.

K. The following are the minimally required elements of the SHECP. The SHECP shall contain the following. Failure of the SHECP to contain the following information shall be grounds for rejection of the submittal. The Contractor may include information beyond what is required herein, but shall limit it to information applicable to the contract scope of work.

1) Cover page with Name of Contractor, Title of Contract, and Contract Number. Include plan revision number, date of revision, name and signature of Safety Engineer responsible for the maintenance and enforcement of the SHECP.

2) Table of Contents that provides section numbers, title or description of the section contents, the page number of the section, and identification of the revision number and revision date of each section.

3) Safety Policy Statement signed by an Officer of the Contractor.

4) Organizational chart of Contractor and Subcontractor personnel responsible for implementing the SHECP and their duties and responsibilities. The chart shall show the reporting relationship and integration of the Safety Engineer with all personnel, including top-level managers, responsible for implementing the SHECP.

5) Description of the relationship between the Prime and Subcontractor(s) and the responsibility for management of site safety.

6) Identification of the Safety Engineer including their duties and responsibilities.

7) Identification of the Safety Supervisor including their duties and responsibilities.

8) Identification of the Competent Person(s) for each of the respective construction disciplines or specialties.

9) A statement regarding the responsibility of all employees to work safely, to not engage in unsafe behavior, and abide by safety rules.

10) A comprehensive description of the project and scope of work under the contract. This section shall be of sufficient detail so that those not directly involved in the project, including reviewers of the SHECP, may attain sufficient knowledge to judge the applicability and adequacy of the SHECP contents.

11) A listing of the known and anticipated hazards to be encountered during the work.

12) A detailed Employee Safety Orientation Plan for all Contractor and Subcontractor personnel (see Section 2.12). The Contractor shall include a Record of Employee Safety Orientation form for employee acknowledgement / sign-off of having received such safety orientation.

13) Requirement for Worker Safety Meetings (i.e. Tool Box Meetings). Include Record of Worker Safety Meeting form to be used to document meetings. At a minimum, the Record of Worker Safety Meeting shall identify the date, topic(s) of discussion, and attendees.

14) Requirement for Safe Work Plans. Include example of Safe Work Plan form.

15) A description of the how the contractor intends to monitor the work site and ensure that employees are following established policies, procedures, and work practices. Requirement for Daily Site Safety Inspections. Daily inspections for each work shift and inspections being recorded in a Daily Safety Report. Include a copy of the proposed Daily Safety Report as an attachment.

16) Requirement for Monthly Site Safety Audits. Include a copy of the example Monthly Site Safety Audit Report to be utilized.

17) Procedures for the Identification and Handling of Unsafe Conditions

18) A section dedicated to Slip, Trip, Fall hazards and abatement

19) Employee Fitness for Duty including monitoring of employee fitness, and handling of employees deemed unfit for duty.

20) Incident/Accident Response - Procedures for Handling and Reporting Injuries, Incidents, Accidents, and Near Misses. Include an Accident Investigation Procedure including a decision chart for identifying root causes. Include Accident Investigation Report form(s). Include a generic action plan for review, analysis and immediate action necessary to prevent recurrences of all accidents or incidents (near misses). The Contractor shall review and if necessary, revise the SHECP based on the occurrence of serious accidents, incidents, injuries, or near misses, and upon any changes in job conditions, or as required by the Engineer.

21) An Emergency Preparedness and Response Plan to include the following:

    a. An Emergency Contact List which shall identify the proper numbers to call for all emergencies including fire, police, medical (hospital, clinic, ambulance), disruptions of train service, and the release of contaminants into the environment, in addition to the phone numbers of all involved parties including the Metro-North contacts and Contractor / Subcontractor Contacts. Identify the location of phones to be used for emergency notification.

b. A plan for the safe and effective response to medical emergencies for Contractor and Subcontractor personnel. Emergency medical services shall include first-aid treatment (including all necessary first aid supplies), and ambulance service (or other standing arrangement) for the immediate transport of injured workers to medical treatment.

c. Include emergency phone numbers for fire and life-safety emergency contacts.

d. Include the name, address, phone number, and driving directions and map(s) of local routes to the hospitals and/or other medical treatment facilities nearest to the project site.

e. An Evacuation Plan that identifies the emergency escape routes or available means of egress during an evacuation, designates the primary and secondary assembly (i.e. muster) areas for personnel, and a system by which each individual can be accounted for in the event of an evacuation, fire, or other such emergency. Include copy of the Employee Roster form or Daily Sign-in/Sign out Log.

f. Include requirement for an annual emergency preparedness drill(s).

g. The identification of potential environmental accidents and emergencies associated with site-specific construction activities. And the response procedures to construction site environmental accidents and emergencies and for the prevention and mitigation of the environmental impacts that may be associated with them.

h. Site security and control: The Contractor shall outline its plan for site security including prevention of unauthorized entry onto the project site and prevention of vandalism. The plan shall include all contractually required security items. This plan shall include where necessary: use of fencing, temporary enclosures, concrete barricades, surveillance cameras, guard service and worker identification.

i. Notification to Engineer and all appropriate agencies.

j. Annual reviews and revisions of the Emergency Preparedness and Response Plan, in particular after the occurrence of environmental accidents and emergency situations.

22) Outline of general safety rules and procedures for the performance of the Work. The Contractor shall ensure that all applicable safety regulations are addressed and included in this section. Examples for inclusion in this section are as follows:

a. Hazardous Communication (HAZCOM) Program,

b. Protection of Existing Public and Private Utilities (Utility Identification, Call Before You Dig)

c. Fall Protection Program,

d. Lock Out / Tag Out,

e. Arc – Flash Protection,

f. Hearing Conservation Program,

g. Respiratory Protection Program,

h. Confined Space Program,

i. Burning & Welding / Use and storage of compressed gases,

j. Powder Actuated Tools

k. Hand & Power Tools

l. Ladders & Scaffolds

m. Handling, Containerization, & Storage of Flammable Materials/Liquids

23) Outline of site-specific safety rules and procedures for the performance of the Work. Examples for inclusion in this section are as follows:

a. Plans for safe ingress and egress,

b. Fall Protection Plan

c. Maintenance & Protection of Traffic / Traffic Control Plans

d. Protection of the Public, and Metro-North Customers and Employees,

e. Plans for fire protection and emergency response, and

f. Plans for Lead and Asbestos Abatement.

24) Employee Conduct, Handling of Employees / Subcontractors Failing to Abide By Safety Requirements, and Disciplinary Procedures for Violations of Safety Rules.

25) Procedure for identification and labeling of products, control of products and materials containing hazardous components, including provisions for maintenance of Safety Data Sheets (SDS).

26) Environmental protection to be implemented by the Contractor during the performance of the Work, including but not limited to, noise control, prevention and/or control of air and water pollution, erosion and siltation control, removal of waste materials, storage of construction materials, protection against fire, minimum disturbance to pedestrian and vehicular traffic, maintaining use of public facilities, protection against fugitive emissions / dust control, on site storage of fuels/petroleum products, spill prevention, leak containment, and clean-up.

27) Procedures for the periodic review and revision of the SHECP.

28) Procedures for the organization and maintenance of safety related documentation

29) Any other related safety information.

2.09 SAFETY ENGINEER (FULL TIME)

A. The Contractor shall provide and assign a full time Safety Engineer to this project within fifteen (15) days of Notice of Award until physical completion of the work. Within ten

(10) days of Notice of Award, the Contractor shall submit a resume documenting the qualifications of the proposed candidate to the Engineer for approval. The individual serving in this capacity is often referred to as the Site Safety Engineer, Safety Manager, Site Safety Manager, Site Safety Officer, Health & Safety Officer, On Site Safety Manager but shall be clearly identified as the "Safety Engineer" throughout all documentation. (Only one Safety Engineer is needed for Contract 1000106733)

B. The authority and responsibility of ***Safety Engineer shall be assigned to a single*** individual ***who is full time on the project and is on the project site while work is actively underway***, qualified as described herein, and a management representative of the Contractor. The Safety Engineer's responsibility shall be limited to managing and monitoring site safety, site security, and environmental protection. The Contractor may subcontract this position to a qualified safety consultant.

C. Upon demonstration by the Safety Engineer, the ability to satisfactorily manage site safety, other supervisory and technical tasks may be assigned to this individual, but his/her first duty is to provide for project safety as described in these specifications. Prior to assigning the Safety Engineer additional responsibilities, the Contractor shall submit in writing to the Engineer, a request to allow the Safety Engineer to assume additional responsibilities. If such approval is granted, Metro-North reserves the right to revoke the same in the event site safety is not being maintained.

D. Metro-North reserves the right to require the Contractor to replace the individual serving in the capacity of the Safety Engineer, at any time, for failure to perform the duties outlined in this section. The lack of accidents or employee injuries on a project shall not be utilized as the sole means of evaluating satisfactory performance of the Safety Engineer.

E. The Safety Engineer shall be present at the locations where the work is actively being performed. The Safety Engineer's regular work shift shall be the work shift with the greatest work activity or the shift with the most hazardous work activity. This may require the Safety Engineer to be present for day, evening, night or weekend shifts. The Safety Engineer may be required to be present for multiple shifts if high hazard or high-risk work is occurring during multiple shifts. Failure to have a Safety Engineer or Safety Supervisor at a work area may result in a stoppage of work at that work area.

F. The Safety Engineer shall be given the authority to alter and implement changes to the contractor's means and methods as necessary to benefit the safety of operations. In the event of an Unsafe Condition, the Safety Engineer shall have the authority to order the work to be stopped in the affected area until the Unsafe Condition is corrected.

G. The Contractor shall not change the approved Safety Engineer without prior written consent of the Railroad.

H. The responsibilities and duties of the Safety Engineer shall include the following:

1) Development of the Safety, Health and Environmental Control Plan (SHECP) and revise as required,

2) Implementation of the SHECP,

3) Monitoring of the Contractor's and each subcontractor's implementation of and adherence to the SHECP,

4) Development and review of Safe Work Plans, and monitor the implementation of the same in the field

5) Ensure that all employees on site have completed the requisite Metro-North training and any other training as may be required by regulation

6) Conduct Employee Site Safety Orientations

7) Conduct Worker Safety Meetings and manage Subcontractor's Worker Safety Meetings

8) Conduct regular inspections of the work site(s) throughout the work shift to identify unsafe work practices and conditions, and monitor implementation of controls and use of proper protective equipment. One (1) of these inspections shall be conducted at the beginning of the shift; within one (1) hour of shift commencement. Such inspections shall be structured to identify unsafe employee work practices and conditions, and implement corrective actions. The findings and corrective actions shall be documented on the Daily Safety Report.

9) Prepare Daily Safety Reports (see Section 2.19)

10) Coordinate and participate in Monthly Site Safety Audits and Monthly Safety Meetings

11) Attendance at all safety related project meetings

12) Conduct incident/accident investigations, prepare and distribute associated reports and documentation, and review to ensure completeness

13) Maintain all safety related documentation

I. Qualifications

1) Required qualifications include the following:

a. The Safety Engineer shall have not less than five (5) years of construction safety or construction safety related experience. The Safety Engineer must be familiar with the work being performed. The resume must include for a five (5) year period, a description of the duties, responsibilities, accomplishments, and safety record of preceding assignments from which the candidate has gained construction safety experience. Experience in construction and/or construction management does not satisfy the requirement for experience in construction safety.

b. A sound working knowledge of Railroad, State, and Federal occupational safety and health regulations.

c. Training in and working knowledge of the use of all necessary health and safety monitoring equipment.

d. American Red Cross or equivalent standard first aid and adult cardiopulmonary resuscitation (CPR).

e. OSHA 40-hour Hazardous Waste Operations & Emergency Response (HAZWOPER) training in hazardous materials safety and health as stipulated in 29 CFR 1910.120 e(3), 8 hours of supervisory training as described in 29 CFR 1910.120 e(4), and 8 hours of refresher training as described in 29 CFR 1910.120 e(8).

f. Successful completion of one (1) or more of the following:

i. An ABIH Certified Industrial Hygienist (CIH) or ASSE Certified Safety Professional (CSP), or

ii. A BCSP Construction Health and Safety Technician (CHST) or Occupational Health and Safety Technologist (OHST), or

iii. Certification as a Site Safety Manager by the New York City Department of Buildings, or

iv. OSHA #500 Trainer Course in Occupational Safety and Health Standards for the Construction Industry, or

v. OSHA #510 Occupational Safety and Health Standards for the Construction Industry, or

vi. OSHA 30 hour Construction Safety and Health Training completed within (3) years of the date of contract award by an OSHA Outreach Training Provider.

2.09 SAFETY ENGINEER (PART TIME) – NOT USED

2.10 SAFETY SUPERVISOR

A. Whenever the Safety Engineer is not present at the work, the duties and responsibilities of the Safety Engineer shall be assigned to a Safety Supervisor [i.e. if there are multiple work locations for a project, multiple shifts or Safety Engineer is sick or on vacation]. The Safety Supervisor's primary responsibility shall be the management of all safety matters under his/her jurisdiction. Failure to have a Safety Engineer or Safety Supervisor at a work area may result in a stoppage of work at that work area.

B. The Contractor shall submit to the Railroad the names and duty tours of the proposed Safety Supervisors.

C. Within fifteen (15) days of Notice of Award, the Contractor shall submit a resume documenting the qualifications of the proposed candidate(s) to the Engineer for approval.

D. Qualifications

1) Required qualifications include the following:

a. The Safety Supervisor shall be familiar with the work being performed, shall be competent to instruct others, and shall be familiar with the SHECP.

b. The Safety Supervisor shall have not less than five (5) years of construction safety or construction safety related experience. The Safety Supervisor must be familiar with the work being performed. The resume must include for a five (5) year period, a description of the duties, responsibilities, accomplishments, and safety record of preceding assignments from which the candidate has gained construction safety experience. Experience in construction and/or construction management does not satisfy the requirement for experience in construction safety.

c. A sound working knowledge of Railroad, State, and Federal occupational safety and health regulations.

d. Training in and working knowledge of the use of all necessary health and safety monitoring equipment.

e. American Red Cross or equivalent standard first aid and adult cardiopulmonary resuscitation (CPR).

f. Successful completion of one (1) or more of the following:

   i. An ABIH Certified Industrial Hygienist (CIH) or ASSE Certified Safety Professional (CSP), or

   ii. A BCSP Construction Health and Safety Technician (CHST) or Occupational Health and Safety Technologist (OHST), or

   iii. Certification as a Site Safety Manager by the New York City Department of Buildings, or

   iv. OSHA #500 Trainer Course in Occupational Safety and Health Standards for the Construction Industry, or

   v. OSHA #510 Occupational Safety and Health Standards for the Construction Industry, or

   vi. OSHA 30 hour Construction Safety and Health Training completed within (3) years of the date of contract award by an OSHA Outreach Training Provider.

2.11 EMPLOYEE TRAINING

A. The Contractor shall ensure the proper training of its employees and subcontractor's employees. Employee training required specifically by OSHA, NYSDOL, NYCDEP, NYCDOB, or other agency regulations shall be provided. Upon request of the Engineer, the Contractor shall submit evidence of such training.

B. All workers shall have completed the OSHA ten (10) hour Construction Safety Course within five (5) years of the contract award date. All management personnel, including Project Managers, Superintendents, Foremen, and Competent Persons shall have completed the OSHA thirty (30) hour Construction Safety Course within five (5) years of the contract award date. Only courses completed through OSHA recognized outreach

training providers shall be acceptable. Evidence of such training shall be submitted to the Engineer and shall be a prerequisite prior to attending Metro-North Site Safety Orientation.

2.12 EMPLOYEE SITE SAFETY ORIENTATION

A. Prior to working on Site, the Contractor's Supervisory Staff, Safety Engineer, Safety Supervisor, Safety Manager or other qualified management representative is to provide each employee with an effective 'Employee Site Safety Orientation'. The contents of the training shall include, but not be limited to, the following:

1) Introduction to the project site, scope of work, and key personnel;
2) Review of the company's Safety Policy;
3) Review of the SHECP and where it is maintained on site;
4) Review of plans supplemental to the SHECP (i.e. HAZCOM, Respiratory Protection Program, Fall Protection Program, Confined Space Entry Program)
5) Review of the safety rules and requirements with a copy distributed to each employee;
6) Employee fitness for duty and substance abuse policy to include 49 CFR 219;
7) Worker responsibilities and disciplinary procedures for violation of safety rules,
8) Review of the Metro-North specific safety requirements, and Grand Central Terminal specific safety requirements (as applicable), with a copy distributed to each employee;
9) Review of the Project Incidence Rates for Recordable and Lost Time Injuries inclusive of prior incidents, accidents, injuries, and near misses
10) Requirement for the immediate reporting of incidents, accidents, injuries, and near misses and follow up with root cause investigation, corrective action and implementation;
11) Site security procedures (i.e. photo ID, company logo/insignia on PPE, sign-in/sign-out log, "if you see something, say something", be aware of suspicious behavior, specific procedures for secured facilities);
12) Emergency Preparedness and Response Plan including identification of medically trained personnel, and location of First Aid and medical facilities, emergency phone numbers;
13) Evacuation Plan
14) Identification of the Safety Engineer and Safety Supervisor(s) and their duties and responsibilities;
15) Procedures in place for the identification and control of job site hazards (i.e. individual's responsibility to report unsafe conditions and work practices, daily safety inspections, safety audits)
16) Review of site-specific hazards, respective controls, and safe work practices;
17) Review of the public, customer, and Metro-North employee safety concerns, the separation and protection of work areas (i.e. signage, barricades, fencing, barriers)

18) Review of the availability and content of Safe Work Plans;

19) Attendance requirements for Daily Safety Briefings, and Weekly Worker Safety Meetings;

20) Personal Protective Equipment requirements;

21) Housekeeping requirements;

22) Fire prevention requirements;

23) Construction equipment and vehicle safety (i.e. seat belts, speed limit, equipment escort/flagging for movements)

24) Warning devices and safety postings.

B. The Contractor shall maintain written records of the Site Safety Orientation program and each individual's acknowledgement of having completed the orientation. As documentation of orientation, the Contractor shall provide a written Record of Employee Safety Orientation whereby each employee acknowledges having received such orientation. Upon completion of the employee's orientation, the employee shall complete the Record of Employee Safety Orientation form. An example of this form shall be included in the SHECP. Copies of the completed Record of Employee Safety Orientation shall be submitted to the Engineer within five (5) working days after the orientation. At a minimum, the record shall include the following:

1) An outline of the topics covered

2) The date the training was completed

3) A statement whereby the employee acknowledges having completed such orientation and agrees to abide by the safety requirements

4) The printed names and signatures of the following:

   a. Employee having received the orientation

   b. Safety Engineer or Safety Supervisor

   c. Individual providing the orientation (if other than the Safety Engineer or Safety Supervisor),

   d. Project Superintendent or Project Manager

2.13 DAILY SAFETY BRIEFING

A. An effective Safety Briefing shall be conducted at the start of each workday, or at any time during the work day when conditions change or new tasks are initiated. All individuals involved in the task shall attend the Safety Briefing. An employee failing to attend a Safety Briefing shall not be permitted to perform any work until the employee has received the same instruction.

B. The briefing is a two way communication tool to ensure that workers know what they will be doing, how it will be accomplished, have the ability to discuss better ways to do the job, and are alert and focused on the job.

C. Employees involved in the work shall be authorized and empowered to recommend changes to the means and methods to increase the safety of the operation. Employees should be encouraged to ask questions pertaining to things they are not confident about. The Contractor shall specifically inform employees of this authority.

D. The Safety Briefing should include:

1) A description of the job and basic steps involved

2) Assignment of tasks and responsibilities

3) A check that all involved are familiar with applicable Safe Work Plans

4) Existing and potential hazards applicable to that shift's work

5) Review of SDS

6) Required tools, equipment, and materials

7) Necessary safeguards and procedures, including specific personal protective equipment required

8) Special conditions to watch for

9) When to stop and re-brief

10) Feedback and questions

2.14 WEEKLY WORKER SAFETY MEETINGS

A. Worker Safety Meetings shall be held no less than one (1) time each week. Each employee of the Contractor and each Subcontractor working at the Site shall attend Worker Safety Meetings.

B. The Worker Safety Meeting shall be conducted by the Safety Engineer or a Subcontractor's Competent Person. The Safety Engineer shall approve the content of each subcontractor's Worker Safety Meeting.

C. The Worker Safety Meeting shall review safe working methods and applicable rules required for the safe performance of the work scheduled during the two (2) week period following the Worker Safety Meeting. Each Worker Safety Meeting shall include,

1) Instruction and discussion of Safe Work Plans applicable to the upcoming work,

2) Review of recent injuries, incidents, accidents, near misses

3) The Engineer reserves the right to direct the Contractor to cover additional information.

D. The Contractor shall notify the Engineer at least one (1) week in advance of each scheduled Worker Safety Meeting.

E. The Contractor shall prepare a written Record of Work Safety Meetings. An example of this form shall be included in the SHECP. Copies of the completed Record of Work E. Safety Meeting shall be submitted to the Engineer within five (5) working days after the Worker Safety Meeting. The record shall include the following:

1) The date and time the meeting was held

2) An outline of the topics discussed

3) The specific Safe Work Plans that were reviewed

4) The printed names and signatures of

   a. All attendees

   b. The individual chairing the meeting

   c. Safety Engineer or Safety Supervisor

2.15 MONTHLY SAFETY MEETING

A. On a monthly basis while on site work is underway, the Contractor shall chair a Monthly Safety Meeting. The Contractor shall inform Metro-North of the meeting schedule (2) weeks in advance. An agenda and minutes of the meeting shall be prepared by the Contractor and submitted to the Engineer within five (5) working days after the meeting.

B. All Contractor personnel responsible for project safety including, management officers that are responsible for developing and maintaining company safety standards and policies (i.e. Corporate Safety Director), the Safety Engineer, the Safety Supervisor, the Superintendent, Foremen, and Subcontractor's Competent Persons shall attend.

C. The agenda for the Monthly Safety Meeting shall minimally include the following:

1) Review of Incidents, Injuries, Accidents & Near Misses and Lessons Learned

2) Review of site safety audits and inspections completed since the last meeting

3) Review of the preceding month's Monthly Site Safety Audit

4) Review of work plans for upcoming operations (i.e. new processes or procedures, sharing of new means and methods, new equipment or products, those requiring special precautions and/or PPE)

5) Development and review of Safe Work Plans

6) Safety program implementation (i.e. review of safety related project documentation for completeness, Incident/Accident/Injury Reports, New Employee Orientation, OSHA 10 hr Construction Safety, OSHA required training such as Fall Protection, Scaffolds, Confined Space)

7) Dissemination of safety related information from Management to Work Force and vice versa (i.e. Safe Work Plans, Incident/Injury Reporting)

2.16 SAFE WORK PLANS

A. The Contractor shall prepare and submit a Safe Work Plan (SWP) for each of the primary construction tasks identified on the four (4) week Rolling Schedule. The SWP shall be structured to correlate with, and be integrated into, the four-week Rolling Schedule. By maintaining parallelism in document formats, a consistent, cohesive effort will effectively merge safety into the construction management process. (See example on following pages.)

B. The SWPs shall be transmitted to the Engineer one (1) week prior to the start of the work covered by the SWP. Failure to transmit SWPs may be grounds for not allowing the work to proceed and for withholding progress payments.

C. A SWP is a written work plan which identifies the tasks and corresponding sub-tasks to be completed, the method of work for performing each task, the hazards associated with the work, and the corresponding equipment and methods that will be used to control the hazards and prevent accidents. The SWP shall define a plan of action for each identified hazard including comprehensive prevention methods for exposures to workers, the public, property, and the environment. Access/egress and setup/breakdown under all expected environmental conditions shall be included.

D. SWP's shall address all foreseeable exposures to the work force, the public, and property. Absence of an applicable standard or regulation does not preclude the Contractor from providing appropriate controls within an SWP. Specific references in the SWP to codes standards and regulations are not necessary.

E. When controls are compliance based, such as for confined space entry, all applicable compliance information shall be included or appropriately referenced. Of particular concern are training items that will be required to educate the employees about exposures such as Worker Safety / Tool Box Meetings held to discuss the hazard and accident prevention methods. More formal off site training (fall protection, confined space, trenching, competent person, etc) should be listed and documentation referenced or provided.

F. Work shall not begin until the SWP has been presented to and accepted by the Engineer. If the SWP does not adequately address all expected, foreseeable hazards posed by the work, the Engineer will require clarification or additional planning to ensure that work proceeds safely. The Contractor's Competent Person involved, shall demonstrate knowledge of the Competent Person responsibilities as defined by OSHA and how the plan will be effectively implemented, to the satisfaction of the Engineer.

G. The SWP shall include the following information and be prepared in accordance with the example shown on the following pages.

1) General Project Information (Contract, General Contractor, Contractor Performing Task)

2) SWP Number (i.e 1, 2, 3), Date, Revision (i.e 01, 02, 03)

3) Primary Task - Describe the scope of work

4) Method of Construction

5) List of equipment and products to be utilized, with product data sheets, material specifications, and Material Safety Data Sheets attached

6) Development Team (Preparers and Reviewers)

7) Competent Person(s) assigned to the task

8) Work Element(s)/Sub Tasks - Describe sub-tasks and activities of the Primary Task, as appropriate. Identify the equipment and methods of construction for the Work Element.

9) Hazard Description - Describe each foreseeable hazard for the Work Element

10) Hazard Control/Accident Prevention - Describe controls and procedures that will be implemented to reduce or eliminate each foreseeable hazard described above; reference attachments as necessary.

11) Training Required – Metro-North Roadway Worker Safety, Fall Protection, Scaffold Erector/Scaffold User, Confined Space, Equipment Operation (i.e. fork lift)

12) Specific PPE Required for Each Task – List the specific PPE required, beyond the standard minimally required PPE for all tasks (i.e. hard hat, safety vest, protective eyewear, work shoes)

13) Implementation / Review with Work Force

H. Priority should be given as follows in controlling hazards:

1) Substitution or change of method to eliminate hazard

2) Engineering controls

3) Provision of Personal Protective Equipment (PPE)

4) Management controls / training, such as a safety monitor for fall exposures.

I. Accident prevention procedures shall be based on industry standards including but not limited to:

1) OSHA Standards

2) Mine Safety and Health (MSHA) Regulations

3) National Institute for Occupational Safety & Health (NIOSH)

4) American National Standards Institute (ANSI)

5) National Fire Protection Association (NFPA)

6) American Conference of Governmental Industrial Hygienists (ACGIH).

SAFE WORK PLAN

SECTION 1 – General Information			
Contract / Project Description:	Croton Harmon Yard Improvements – Phase IV	**SWP No.:**	1
General Contractor:	ABC Constructors	**Date:**	01/21/10
Contractor Performing Work:	DEF Excavating	**Revision No.:**	01
Primary Task:	Installation of Oil Water Separator. Excavate a pit approximately (10) feet long by (10) feet wide and (8) feet deep in the northwest corner of the yard near Track 4 and install oil water separator.		
Method of Construction:	Standard cut and cover excavation		

Equipment / Materials (Product Data Sheets & SDS Attached):	
Cat 245 backhoe equipped with 1.5 yard toothed bucket and lifting hook will be used to excavate, place materials, and backfill	20 yard dump truck will be used to remove excavated material from the Work Area
An engineered shoring system will be used to protect against cave-in and to support the soil near the track bed on Track 4	Wire rope slings and shackles will be used to lower oil water separator and top section into pit
Gasoline powered tamper will be used to compact soil during backfilling	Shovels, rakes, and hand tools will be used for various tasks

SECTION 2 – Development Team					
Prepared By:	**Position/Title**	**Date**	**Reviewed By:**	**Position/Title**	**Date**
John Doe	Laborer	01/12/10	Jane Mayfield	Safety Engineer	01/19/10
Bob Catt	Equipment Operator	01/12/10			
Phil Spoil	Excavation Foreman	01/13/10			

SECTION 3 – Competent Person(s) Assigned			
Competent Person	**Discipline**	**Competent Person**	**Discipline**
Phil Spoil	Excavation	Bob Fume	Confined Space Entry
Clevis Shackle	Rigging		

SAFE WORK PLAN

SECTION 4 – Safety Analysis			
Work Element(s)/Sub Tasks:	**Hazard Description**	**Hazard Control/Accident Prevention**	**Specific Training & PPE Required**
Excavate - Dig pit for oil water separator Place Gravel - Place and level pea gravel in excavation	Potential collapse of excavation and related excavation hazards	Excavation will be shored utilizing a pre-engineered shoring system. Ladders will be provided for safe entry and egress. Ladder to extend 36" above excavation. A guardrail will be installed on top of the shoring system to protect against falls into the open excavation.	Fall Protection
	Hazards of moving vehicles.	The backhoe and dump truck are equipped with back up alarms. The swing area of the backhoe will be cordoned off with caution tape. A spotter will be provided while the truck is backing.	
Set Oil Water Separator - Lower precast unit in place and level Install Top Section - Set precast top section (manhole)	Crushing hazard while placing sections of oil water separator.	Tag lines will be used while lowering sections. Workers will not be permitted in pit until load had been safely landed. All wire rope slings and rigging has been specified for the lift and will be inspected daily.	
Connect Pipes - Connect concrete drain pipes to unit Inspection - Conduct final inspection and tests	Confined space exposures when entering oil water separator to make pipe connections and during final inspection.	Confined space procedures as outline in the Safety Health and Environmental Control Plan will be followed. Air monitoring will be performed prior to entry and throughout the course of work in the confined space. Rescue equipment will be maintained on site.	Confined Space Monitoring Confined Space Rescue Equipment
Waterproofing - Apply mop down asphalt waterproofing	Exposures to hazardous materials while working with gasket materials and waterproofing.	SDS sheets will be obtained on the materials and workers will be provided with the proper PPE as required in the SDS.	Face Shield Rubber Gloves Protective Clothing Respiratory Protection
	Exposures to burns from hot asphalt waterproofing.	Each worker performing waterproofing operations will be required to wear cotton work clothes including long sleeve shirts. Each workers handling buckets of material	

		and tending the kettle will be required to wear protective gloves and face shields.	
Backfill & Tamp - Restore site to finish grade	Hazards of moving vehicles.	The backhoe and dump truck are equipped with back up alarms. The swing area of the backhoe will be cordoned off with caution tape. A spotter will be provided while the truck is backing.	
All Tasks	Heat Exhaustion / Heat Stroke	Wear loose fitting, breathable clothing. Break periods and worker rotation may be necessary. Potable water will be provided and consumption encouraged via toolbox talk about heat stroke exposures.	
	Miscellaneous exposures	Hard Hats, safety glasses and safety vests are minimally required PPE	
		As summer progresses, proper clothing requirements will be enforced. (No shorts, proper shoes, short sleeve shirts, no tank tops)	

SECTION 5 – Implementation / Review with Work Force					
Print Name	**Signature**	**Date**	**Print Name**	**Signature**	**Date**

2.17 DAILY EMPLOYEE SIGN IN / SIGN OUT LOG

A. In support of the Contractor's Emergency Action Plan and Evacuation Plan, the Contractor shall maintain a sign-in / sign-out log of all employees working on Metro-North property. The log shall be completed daily. The log shall be submitted to the Engineer daily; on the next shift following the previous shift. (See example on following pages.)

B. The heading of the log shall include the following information: Contract number, Project description, Location of the work, Work shift hours, Name and Emergency Contact Information for Designated Emergency Contact (DEC), Superintendent, or Team Leader.

C. The body of the log shall include the following information: Employee Printed Name, Name of Employer, Date & Time Entering Work Site with Signature, Date & Time Leaving Work Site with Signature.

D. The logs must be available to the MTA Police and the Engineer within two (2) hours of the shift start time.

E. During an emergency situation or evacuation, the logs must be available to emergency services forthwith.

2.18 DAILY FINAL INSPECTION OF WORK SITE

A. At the completion of each work shift and prior to vacating the site, the Contractor shall conduct a final inspection of the project site. The purpose of the inspection shall be to ensure the site is adequately secured prior to being vacated. The Contractor shall notify the Engineer of having completed such inspection.

B. At a minimum, the inspection shall include the following:

1) The soundness, stability and security of equipment and material installed during the shift,

2) Housekeeping / cleanliness of site,

3) Removal of equipment, tools and materials from areas open to the public, customers, and employees,

4) Temporary protections to safeguard the public (i.e. fencing, barricades, signage),

5) Temporary and security lighting,

6) Potential fire hazards (i.e. equipment left running, electrical),

7) Securing of materials (i.e. materials that may be displaced by wind and/or water),

8) Securing of the site, including temporary facilities and equipment (i.e. storage areas, equipment, field offices, security gates)

CONTRACTOR EMPLOYEE SIGN IN / SIGN OUT LOG

Emergency Numbers	MTA Police	Operations Command Center / Rail Traffic Controller	GCT Station Master's Office / Fire Command Center
	(888) 682 - 9117 or (212) 878 - 1000	(212) 340 - 2050	(212) 340 - 3191 / 3192

Contract Number / Project Description		**Contractor (Prime)**	
Work Location *(Give this description to emergency services)*		**Field Office Location / Phone**	

	Day (circle)	Date	Time		Day (circle)	Date	Time
Start	M T W H F SA SU	05/24/10	2100	**Finish**	M T W H F SA SU	05/25/10	0500

Contacts	Contractor's Site Representative	Contractor's 24 hr Emergency	Metro-North Project Manager	Metro-North Representative
Name				
Cell Number				
Office Number				

Metro-North Authorization Print Name: _____ Signature: _____

Name (Print)	RW Training#	Company	Date	Time On Site	Signature	Date	Time Off Site	Signature

CONTRACT EMPLOYEE SIGN IN / SIGN OUT LOG

Name (Print)	RW Training#	Company	Date	Time On Site	Signature	Date	Time Off Site	Signature

2.19 DAILY SAFETY REPORT

A. A Daily Safety Report shall be completed for each work shift and work area by the Safety Engineer/Safety Supervisor and shall be transmitted daily to the Engineer. An example of the proposed format of the Daily Safety Report shall be provided in the SHECP.

B. The Daily Safety Report shall include, at a minimum, the following information:

1) A header providing the general project information;
   a. Contract Number
   b. Project Description,
   c. Date,
   d. Work shift times,
   e. Inspection times,
   f. Work area(s) inspected, and
   g. Weather conditions
2) Commendable actions or observations pertaining to worker safety
3) An entry for each safety deficiency that includes;
   a. Location and nature of deficiency,
   b. Time noted,
   c. Names of persons and firms that were notified* of the deficiency including time notified; and

      (*NOTE: Notification shall include at a minimum the parties exposed to the safety hazard, the parties responsible for creating the deficiency, and the parties responsible for correcting the deficiency.)

   d. Time and nature of corrective action(s)
4) An entry for each deficiency that was not corrected on the prior shift's Daily Safety Report until the deficiency is corrected;
5) A notation of each accident, incident, or injury reported including name of injured party or affected property owner; time of accident, incident, or injury, and description of accident, incident, or injury;
6) Notation of Safety Meetings conducted and attended including type of meeting and the name of each person in attendance;
7) A notation of visits by safety representatives of the Railroad, City, State or Federal Authorities, including name and phone number of representative, time of visit, and department or authority represented; and
8) Printed name and signature of person completing the report

2.20 MONTHLY SITE SAFETY AUDIT

A. For the duration of the project, ***the Contractor shall perform at least one (1) comprehensive site safety audit every month during which there is on site activity***. The Monthly Site Safety Audit shall be performed by a team of individuals of the Contractor, and Subcontractor(s) that are responsible for project safety, including but not limited to, management officers that are responsible for developing and maintaining company safety standards and policies (i.e. Corporate Safety Director), the Safety Engineer, the Safety Supervisor, the Superintendent, Foremen, and Competent Persons. The Contractor shall inform Metro-North Railroad and Third Party Construction Management of the meeting schedule (2) weeks in advance so they may attend. The Safety Engineer shall prepare a report of the findings of the audit (i.e. Monthly Site Safety Audit Report). A copy of the completed Monthly Site Safety Audit Report shall be submitted to the Engineer. The findings of the Monthly Site Safety Audit shall be reviewed during the Monthly Safety Meeting.

2.21 INCIDENT, INJURY, ACCIDENT, & NEAR MISS NOTIFICATION & REPORTING

A. In the event of any incident, accident, employee injury, or near miss, the Contractor shall adhere to the following notification and reporting requirements.

B. The Contractor shall instruct all of its employees and Subcontractor's employees that they are required to immediately notify their Supervisor of ALL incidents, injuries, accidents, illnesses, and near misses related to the work, no matter how insignificant they seem at the time.

C. INITIAL NOTIFICATION REQUIREMENTS

1) The Contractor shall immediately notify the Engineer of all incidents, injuries, accidents, and near misses involving personal injury, causing damage to property or the environment, affecting the safe movement of trains, or illnesses related to the work. The injured person's immediate supervisor, a representative of the third party construction management firm, or other person who directly observes the incident, shall provide immediate telephone notification to Metro-North Construction Management. Telephone notification shall be provided to the following:

   a. The Metro North Construction Manager and/or Project Manager, or Third Party Construction Management Firm, and

   b. The Manager of the Owner Controlled Insurance Program (OCIP), as applicable

2) Resident Engineers on projects managed by third party construction management firms may be designated as the first point of contact for the notification of incidents. A protocol must be established for the immediate notification of Metro-North Construction Management and/or Project Management by the Resident Engineer / third party construction management firm.

3) Near misses shall be reported to the Engineer and a Lessons Learned session shall be convened. Any Near Miss incident involving rail equipment requires a full investigative report.

4) If this contract is covered under the Owner Controlled Insurance Program (OCIP), refer to OCIP specifications for additional information.

D. REPORTING REQUIREMENTS

1) **Contractor Employee Injury**

a. In the event an employee of the Contractor or an employee of a subcontractor is injured on the Site, follow the reporting procedures below. The following applies to ALL injuries, whether deemed OSHA Recordable, or not:

b. The injured employee must immediately report the injury to the Contractor.

c. The Contractor must immediately report the injury to the Engineer and the OCIP Administrator (as applicable).

d. The Contractor must provide the information listed below to the Engineer within two (2) hours of the incident, or by the end of the work shift during which the incident occurred, whichever is earlier. Metro-North Construction Management requires this information in order to complete the Metro North IR-1 Initial Report of Incident.

i. Date and Time of Incident

ii. Reason for Incident Not Being Reported Immediately (if applicable)

iii. Location of Incident

iv. Brief Description of Incident

v. Name, Home Address, Daytime Phone, Evening Phone, and Date of Birth of Injured Person (Social Security Number not required)

vi. Employer of the Injured Person

vii. Description of Injury and Disposition

e. The Contractor shall transmit the following to the Engineer (and OCIP Administrator if the project is covered under the OCIP) within twenty-four (24) hours of the incident:

i. C-2 Employer's Report of Work Related Injury/Illness

NOTE: The employer of the injured employee must complete the applicable workers' compensation claim form (C-2 in New York, C-10 in Connecticut). If the project is covered under the OCIP, the appropriate form shall be submitted to the On-Site Insurance Administrator within 24 hours. The On-Site Administrator will notify the appropriate Insurer, who will notify the Workers Compensation Board. Penalties are sanctioned to insurance carriers when reports to the Workers Compensation Board exceed 10 days.

ii. Contractor's Accident/Injury Investigation Report, or OCIP Form 5 – Supervisor's Accident Investigation Report

f. All reports must be submitted within twenty-four (24) hours of each accident.

g. The Contractor shall make every effort to prevent further injury to others and to secure accident evidence and witness information. The Contractor shall provide the following supporting documentation, if available.

i. Addendum to OCIP Form 5 - Witness List and Statement Form

ii. Photographs of the accident site, machinery, and/or equipment involved in the accident

iii. Description of the machinery or equipment involved in the accident

iv. Police reports

v. Evidence of a suspicious claim

vi. Other relevant information

2) **Employee Requiring Medical Attention**

a. The Contractor has the primary responsibility to accompany the injured employee to the nearest Hospital Emergency Room or Urgent Care Facility.

b. The attending physician should be instructed to give the injured employee a note indicating one of the following:

i. The employee is cleared to return to work

ii. The employee requires additional medical treatment and will be disabled for a specified number of days.

c. The Contractor shall provide the following additional information pertaining to injuries as it becomes available.

i. Description of the Medical Treatment Provided (if divulged by employee)

ii. Diagnosis by Physician / Medical Practitioner (if divulged by employee)

iii. Medication Prescribed & Dosage (including over the counter medications)

iv. If the injury will result in lost work days (i.e. Lost Time Injury)

v. If the individual will be placed on Restricted Duty.

3) **Serious Injuries or Fatalities to Employees**

a. "Serious Injuries" or fatalities to employees must be reported immediately by the Contractor via telephone to the Engineer and the OCIP Administrator (as applicable)

b. Serious Injuries include, but are not limited to:

i. Fatalities, or injuries that can cause death

ii. Spinal Cord injuries

iii. Burns to 10% of more of the body

iv. Amputations or crushing injuries

v. Eye injuries causing partial or full loss of sight

vi. Severe head injuries

vii. Exposure to toxic substances

viii. Any occupational disease

ix. Any single occurrence involving hospitalization

4) **Reporting Procedures for Incidents Involving Third Party Injury, Property Damage, Environmental Pollution or Builders' Risk**

a. "Serious Injuries" or fatalities to third parties must be reported immediately via telephone to the Engineer and the OCIP Administrator (as applicable).

b. The Contractor shall report all incidents, regardless of injuries sustained or property damage claimed, within twenty-four (24) hours to the Engineer and OCIP Administrator (if applicable).

c. The Contractor shall provide a completed Accident Investigation Report to the Engineer and OCIP Administrator (if applicable) (Form 5 - Supervisor's Accident Investigation Report for OCIP projects).

d. If the project is covered under the OCIP, the OCIP Administrator will report the claim to the appropriate Insurer.

e. The following documents must accompany the Accident Investigation Report or Form 5 - Supervisor's Accident Investigation Report (OCIP projects):

i. Photos of accident site

ii. Witness Statements (Addendum to Form 5)

iii. Police report, if applicable

5) **Distribution of Correspondence**

a. Correspondence pertaining to an injury, accident, incident, or near miss shall be distributed to the following:

i. Resident Engineer

ii. Metro-North Capital Programs Senior Director

iii. Metro-North Project Manager

iv. Metro-North Project Manager's Departmental Director

v. Metro-North Construction Manager

vi. Metro-North Construction Manager's Departmental Director

vii. Metro-North Construction Manager's Departmental Deputy Director

viii. Metro-North Manager, Construction Safety

ix. Metro-North Safety Department

b. If the project is covered under the Owner Controlled Insurance Program (OCIP), correspondence distribution shall be extended to the individuals shown in the OCIP Administration Directory.

****COPIES OF ALL REPORTS ARE TO BE RETAINED IN THE CONTRACTOR'S RECORDS.**

2.22 POST INCIDENT REVIEW

A. The Contractor shall conduct a Post Incident Review for all incidents that resulted in Recordable Injuries, $5,000 or more in property damage, and Near Misses that could have resulted in injury or property damage. The primary purpose of the Post Incident Review is to learn from the accident, determine the cause of the accident, and actions to be taken to prevent a recurrence of such an accident. The Contractor shall notify the Engineer of the meeting schedule to permit the Railroad to attend.

2.23 UNSAFE CONDITIONS

A. An Unsafe Condition is a condition that gives rise to the imminent possibility of injury to workers or the public, of serious damage to property or the environment, or of effecting the safe movement of trains.

B. The Contractor shall instruct its employees and Subcontractor's employees to immediately inform their Supervisor of any and all Unsafe Conditions.

C. When an Unsafe Condition exists at the Site, the work shall be stopped in the affected area until the Unsafe Condition is corrected. If the Contractor does not take corrective action immediately or within the time period specified by the Engineer, the Engineer reserves the right to take whatever action is required to correct the hazard or unsafe condition and back charge the Contractor for the costs associated with the remedial work.

2.24 MAINTENANCE OF SAFETY RECORDS

A. The Contractor shall maintain the following Safety Records for a period of not less than six (6) years after Construction Completion:

1) Safety, Health, and Environmental Control Plan;
2) Safe Work Plans;
3) Daily Safety Reports;
4) Monthly Safety Audit Reports;
5) Records of Worker Safety Meetings;
6) Records of Employee Training (i.e. Roadway Worker Safety, OSHA 10 Hour Construction Safety, Employee Site Safety Orientation, OSHA required training)
7) Competent Person Designations;
8) Material Safety Data Sheets;
9) OSHA Forms 300, 300A, and 301
10) Contractor's Accident/Injury Investigation Report, C-2 Employer's Report of Work Related Injury/Illness, Form 5 Supervisor's Accident Report, Witness Statements/Addendum to Form 5;

11) Any permits required;

12) Written notice of Citations, Suits, or Complaints; and

13) Other compliance records as required by City, State, and Federal Agencies.

2.25 PROTECTION OF THE PUBLIC

A. The Contractor shall provide, erect, and maintain substantial, durable, and effective protective devices including but not limited to, guardrails, barricades, protective enclosures, fences, bridging, sidewalk sheds, platforms, ramps, floor coverings, road plates, sidewalks, guide rails, lights, traffic control devices, warning signs and signals, pedestrian detour signs, pedestrian information signs, cones, traffic barrels, and other protective devices as required by the Work or elsewhere in the Contract to adequately protect the Work and all individuals against injury to their person or damage to their property.

B. Protective devices shall be designed to protect the public and others on or adjacent to the Site from potential exposures created by the work. Such protective devices shall include but not be limited to; the use of welding screens to protect against welding flash, the use of solid barricades or tarps to protect against flying objects or debris created by cutting, chipping or grinding, or the use of fully sealed enclosures to protect against exposures to hazardous vapors, fumes, or dusts.

C. The Contractor shall promptly replace any of the foregoing that must be removed temporarily during the progress of the Work. If replacement is not properly made, the Engineer shall have the right to effect such replacements at the expense of the Contractor.

D. Protective devices shall be designed to withstand the reasonably anticipated forces in or around the work area including but not limited to wind, vibration, runoff, and other natural or man-made conditions.

E. Protective devices shall be maintained in a clean and smooth condition so as not to cause cuts, nicks, splinters, or snag clothing. The use of double headed nails is prohibited.

F. Each protective device shall be dismantled and removed from the site by the Contractor when the device is no longer required and prior to demobilization.

G. Each protective device shall be constructed of properly identified fire rated materials. Combustible materials shall be fire retardant treated and contain markings evidencing such.

H. The Contractor shall provide boundary fencing around the perimeter of the construction site and staging areas. The boundary fencing shall be constructed as to segregate work areas from non-work areas. Boundary fencing shall be of chain link type and a minimum of eight feet (8') in height. The Contractor shall install access gates or removable fence sections as necessary to maintain access to, and emergency egress from, the work area. The number and location of access points shall be determined by the Contractor and submitted to Metro-North Railroad for review. Additional access/egress points shall be added as necessary to maintain site safety and accessibility.

I. Locations of intermittent or short duration work may be protected by barricades and/or fences a minimum of four feet (4') in height. Barricades or fences eight feet (8') or higher shall be provided along work areas with moderate to heavy pedestrian traffic or along work

areas where site security is required. Barricades and fences shall be rigid and capable of preventing unauthorized entry into the work area. Barricades and fences shall be maintained in a continuous unbroken line along the work area. Fencing shall be supported at regular intervals as to maintain its integrity. Caution tape or unsupported fencing shall not be considered a rigid barricade.

J. Covers, plates, and bridging used to protect holes shall be constructed so as to reduce potential slip and trip hazards. All covers, plates, and bridging shall be secured against movement. Covers, plates, and bridging shall be installed in accordance with ADA Accessibility Guidelines for Buildings and Facilities (Appendix A to 36 CFR Part 1911). All such covers, plates and bridging shall be solid and coated with slip resistant materials so that the surface is at least as slip resistant as the surrounding walking surfaces. The perimeter of floor covers and plates shall be painted yellow or another contrasting color approved by the Railroad.

2.26 SIGNAGE

A. All signs installed under this project or required by the work, including but not limited to those used for traffic control, traffic detour, pedestrian detour signs, pedestrian information signs, and general warning signs, shall meet DOT requirements for size, reflective sheeting, lettering, etc. in accordance with the Manual of Uniform Traffic Control Devices (MUTCD).

B. The Contractor shall install and maintain safety signage for the duration of the on site work. Signage shall meet the requirements of 29 CFR 1910.145. Signage shall be installed along construction fencing, the outer boundaries of the project site, or at entrances to work areas. Signs shall be installed at intervals not to exceed one hundred lineal feet (100'). Signs shall be secured via mechanical fasteners in clearly visible locations.

C. A minimum of two (2) signs shall be required. One sign shall read "DANGER – CONSTRUCTION SITE – AUTHORIZED PERSONNEL ONLY", or approved similar language. One sign shall read "CAUTION – PERSONNEL PROTECTIVE EQUIPMENT REQUIRED BEYOND THIS POINT", or approved similar language. Signs shall be weatherproof and a minimum size of fourteen inches in length by ten inches in width (14" L x 10" W).

2.27 STORAGE AND OFFICE TRAILERS

A. Trailers shall be fully chocked and tied down to prevent overturning in high wind conditions. Storage and office trailers shall be equipped with auxiliary supports at each corner.

B. Office and storage trailers shall be electrically grounded.

C. Identification and emergency signage shall be installed on the exterior of office and storage trailers. Signs shall be constructed of weatherproof material, have a white background with black lettering, and shall be a minimum of five feet in length by three feet in width (5' L x 3' W). Signs shall identify the entity occupying the facility, the site address, and a telephone number to contact in the event of an emergency.

D. Office and storage trailers shall be equipped with the following Fire-Life Safety devices and equipment:

1) Office Trailers

a. Fire Alarm Panel (FAP) equipped with a dialer programmed to call MTA Police, RTC's at GCT, and the local fire department

b. Smoke detectors (tied into the FAP)

c. Pull stations (tied into the FAP) at all exit doors

d. Horn strobe

e. Fire extinguisher – 20 lb ABC type

f. Battery back-up emergency exit lights

g. Evacuation plan

h. Fire suppression system (i.e. sprinkler), within GCT only

i. Emergency contact list posted

2) Flammable & Combustible Storage

a. Smoke detectors (tied into the FAP)

b. Fire extinguisher – 20 lb ABC type

c. Battery back-up emergency exit lights

d. Fire suppression system (i.e. sprinkler), within GCT only

e. Exterior strobe light

3) Dry Storage (Tools, Nonflammable, & Noncombustible Materials)

a. Smoke detectors (tied into the FAP)

b. Fire extinguisher – 20 lb ABC type

c. Battery back-up emergency exit lights

d. Fire suppression system (i.e. sprinkler), within GCT only

e. Exterior strobe light

2.28 TEMPORARY CONSTRUCTION

A. All materials, whether to be used for temporary or permanent construction, shall be fire resistant, and when possible, incombustible materials shall be chosen over combustible materials. Each temporary structure shall be constructed of fire resistant or fire retardant treated material. All materials (i.e. lumber, plywood) shall be fire retardant treated and contain the manufacturer's stamps evidencing such. If the stamps are illegible or otherwise not provided, the material shall be immediately removed from the premises and replaced at no additional expense to Metro-North. On site application of fire retardants by the Contractor is prohibited, except when the material is not commercially available pretreated from the manufacturer.

B. Temporary construction barriers within occupied facilities used to segregate work areas from non-work areas shall be constructed as to provide a minimum of a two (2) hour fire rating. Should local codes be more stringent, the more stringent code shall apply.

C. Temporary construction shall be properly, sturdily and securely constructed as necessary to serve its intended purpose. Unless otherwise directed, temporary construction shall be designed and constructed to withstand a one hundred mile per hour (100 mph) wind load. Temporary construction shall be maintained throughout the work as not to pose a hazard to workers and the public. Temporary construction shall be properly braced, secured, and tied down as necessary to prevent displacement.

D. Temporary construction shall be dismantled and removed from the site by the Contractor when the device is no longer required and prior to demobilization.

E. The use of screw fasteners / bolts shall be the preferred method of joining in locations subject to wind stress (i.e. platforms).

F. Protection consisting of physical guards, covers, foam padding, etc. shall be provided on or around protruding objects (i.e. bolts). The use of double headed nails, or other fastening devices that create an unnecessary snag or impalement hazard, are prohibited from use unless properly guarded to eliminate the hazard.

2.29 PRODUCTS / MATERIALS CONTAINING HAZARDOUS AGENTS

A. When choosing between equally performing materials and/or products, the Contractor shall make every effort to use products that are less deleterious to worker health and those that are environmentally friendly. When equally performing products are available, waterborne products shall be chosen over solvent borne materials.

B. Care shall be taken when using products containing volatile organic compounds (VOC's) such as aromatic solvents. In addition to implementing proper worker protection, the Contractor shall provide adequate ventilation and separation of areas where VOC containing products are being used.

C. All products and/or materials containing hazardous agents shall be submitted to the Engineer for review. Products and/or materials containing hazardous agents shall not be used or incorporated into the work until reviewed and accepted by the Engineer.

D. The Contractor shall submit product data sheets, material specifications, and Material Safety Data Sheets for review. Physical samples shall be submitted upon request. The submittals shall be received well in advance of the scheduled usage or incorporation of the product as to allow sufficient time for review.

2.30 MATERIALS SUSPECT OF CONTAINING ASBESTOS, LEAD, PCB, MERCURY, OR OTHER TOXICS

A. The Contractor shall not disturb any materials suspect of containing asbestos, lead, PCB, mercury, or other toxic materials without the prior approval of the Engineer. If during the work, the Contractor identifies or otherwise uncovers such materials, the Contractor shall immediately notify the Engineer. The Contractor shall clear personnel from the area and cease work in the location of the suspect material until an assessment by qualified persons can be performed.

2.31 SAFETY DATA SHEETS

A. The Contractor shall submit to the Engineer current Safety Data Sheets (SDS) for all materials to be stored, incorporated into, or used in the Work. Hard copies of SDS shall be on file and at the ready at all times at the jobsite. SDS shall be organized and/or catalogued as to facilitate reference during an emergency condition. The SDS shall be readily available whenever required, in a convenient location, in close proximity to where the materials are used on the project. The Contractor's safety personnel and competent persons shall have ready access to the SDS.

2.32 MATERIAL HANDLING, LABELING, STORAGE, USE & DISPOSAL

A. All materials brought onto the jobsite shall be labeled. Labeling shall include but is not limited to, identification of the material and manufacturer, caution labels, hazard labels, warning/danger labels, use and instruction labels, servicing instructions, medical attention labels.

B. When bulk material is transferred from large storage containers to smaller point of use containers, at a minimum, the point of use containers shall be identified as to contents.

C. Products shall not be transferred into containers that are not designed to carry the product, or that are unsuitable for, or incompatible with, the product. At no time shall food containers (i.e. water bottles) be used for product containers.

D. The Contractor shall ensure that each hazardous material is clearly marked, labeled in accordance with either the NFPA 704 Hazard Warning System (NFR Diamond) or the color bar format (HMIG labels) as specified in the OSHA Federal Hazard E. Communication Standard (29 CFR 1900.1200). Each Hazardous material shall be stored in accordance with manufacturer's recommendations, NFPA Standards, OSHA Standards, and all other storage provisions of this Contract.

E. Flammable materials shall be stored in approved containers, within flammable storage cabinets, and in accordance with NFPA guidelines.

F. The Contractor shall provide details on the handling, use, and storage of flammable solvents and solvent containing products, corrosive or acidic products, toxic chemicals, and other hazardous products.

2.33 FIRST AID, MEDICAL TREATMENT & MEDICALLY TRAINED PERSONNEL

A. The Contractor shall provide first aid equipment, supplies and competent administering of first aid as may be reasonably prescribed by good practice or as may be required by any law for the care of injured personnel.

B. The Contractor shall provide an individual(s) that is certified in administering First Aid, Cardio Pulmonary Resuscitation (CPR), and use of an Automatic External Defibrillator (AED).

C. The Contractor will not be allowed to commence Work until there is a sufficient supply of first aid equipment, medically trained personnel (i.e. first aid, CPR, and AED), and an operable Automatic External Defibrillator (AED) as determined by the Engineer, at all work locations for its employees and all Subcontractors. Any resultant delay will be charged to the Contractor.

D. First Aid stations of adequate size and contents shall be provided by the Contractor. Such shall be located within reasonable proximity to the work site. Large work sites may require multiple First Aid stations be established throughout the project. The Contractor shall conduct a hazard assessment to determine the appropriate contents and locations of the First Aid stations.

E. The Contractor shall provide, and make arrangements with local hospitals, medical clinics, or other medical facilities, for the medical treatment of persons that are injured or become ill during the work. Such facilities shall be clearly identified in the Contractor's Emergency Action and Evacuation Plan and include the addresses, phone numbers, and maps with driving directions to said facilities.

2.34 PERSONAL PROTECTIVE EQUIPMENT (PPE)

A. The Contractor shall provide, make readily available, and ensure the use of all Personal Protective Equipment (PPE) required or recommended for the work. Personal protective equipment as required shall include, but not be only limited to, the appropriate/approved hard hats, safety shoes, gloves, goggles, eye/face shield protection, safety belts, harnesses, respirators, hearing protection, traffic safety vests, etc.

B. The Contractor shall have the responsibility for monitoring and enforcing compliance by all employees, including subcontractors, with these provisions regarding the wearing and proper use of personal protective equipment. No person will be allowed on Railroad property, or the job site if off Railroad property, without the necessary PPE, including proper work clothing and work shoes/boots. Any Contractor employee not in compliance with having the appropriate personal protective equipment (PPE) will be forbidden to be on all Metro-North premises. Any resultant delay will be charged to the Contractor.

C. The Contractor shall enforce Metro-North's requirement for the use of the following Personal Protective Equipment. Unless otherwise directed, the following is the standard PPE that shall be worn at all times while within the construction work area, on or about the tracks, on or along the right-of-way, in train yards, or in maintenance facilities and shops.

1) Work Clothing – Work clothing shall be suitable for heavy construction work and at a minimum, consist of long pants and a short sleeve shirt (no tank tops or short trousers of any type). Long sleeve shirts shall be worn as necessary.

2) Foot Protection – Work boots with safety toe and ankle coverage. Work boots shall be at least six inches (6") high, and be completely laced or buckled. The shoe shall have definite heels that are no more than one inch (1") in height.

3) Hard Hats - Hard hats shall be SEI Certified as meeting the ANSI Z89.1-2009 requirements for Type I Class E protection.

4) Eye Protection – meeting ANSI Z87.1

5) Safety Vests - Safety Vests shall be flame retardant, 360-degree reflective, high visibility orange, and 100% tear away. The contractor's company name, logo, insignia or the word "Contractor" shall be permanently printed on or sewn into the vest.

6) Hand Protection (Gloves) – Unless the finger dexterity required by the task precludes the use of gloves, hand protection (i.e. work glove) shall be required. Gloves shall be appropriate for the type of work.

D. Hard hats and safety glasses are mandatory at all times within construction work sites, on or about tracks, on or along the Right-of-Way, in maintenance facilities, shops, or yards, or on or about roadways.

E. Safety vests are mandatory at all times when on or about tracks, on or along the Right-of-Way, in maintenance facilities, shops, or yards, or on or about roadways.

F. In addition to the previously listed PPE, the Contractor shall provide, and require use of, other PPE (i.e. hearing protection, face protection, respiratory protection) as required by safety and health standards, recommended by product Material Safety Data Sheets, or recognized as standard protection for the task being completed.

G. The Contractor will not be allowed to commence work until there is a sufficient supply, as determined by the Engineer, of PPE for its employees and its Subcontractors on the job site. Additionally, the Contractor shall maintain, at the job site, a sufficient supply of extra PPE that can be issued as a replacement should a worker's PPE become damaged or otherwise unusable.

2.35 SANITATION

A. The Contractor shall provide sanitary facilities for all employees on this project. The number of facilities provided shall be commensurate with the size of the work force. Facilities shall be located within a reasonable proximity to the work site. Facilities may have to be mobile or sited at multiple locations for projects involving transient operations or work spread over multiple sites. Locations of facilities shall be reviewed with the Engineer prior to placement. Facilities shall be kept in a clean and sanitary condition, and properly screened from public observation to the satisfaction of the Engineer. Same shall be removed when so directed.

2.36 HOUSEKEEPING

A. The Contractor shall provide for the regular housekeeping of all areas within the project limits. The Contractor is responsible for the regular cleaning of the site to maintain its appearance and safety of the workers and the public throughout the construction. This includes removal of all wastes resulting from the construction, rubbish, and debris whether it was generated by the contractor or not.

B. The removal of general refuse such as food wrappers, drinking containers, newspapers, etc. shall be included in the housekeeping of the site.

C. The Contractor shall provide proper receptacles for waste disposal, whether they be roll-off containers for bulk disposal of construction wastes or smaller waste cans/barrels for common refuse.

D. Combustible debris shall be removed regularly and as necessary to prevent accumulations that may pose a fire hazard.

E. Specific care shall be taken to prevent impalement/puncture hazards created by lumber with protruding nails/screws. Such shall be removed or hammered flat.

F. Work areas shall be pre-cleaned of existing debris that may pose hazards prior to the start of construction work (i.e. organic debris such as leaves and newspapers that may cover broken bottles, sharps, etc. under platforms).

G. Equipment and materials shall be stored in a neat and orderly fashion and properly secured when not in use.

H. Walkways and walking surfaces shall be continuously monitored for objects and materials that may pose tripping and slipping hazards and shall be maintained free and clear of the same.

I. Employees performing housekeeping shall be provided proper personal protective equipment.

2.37 PROTECTION OF UNDERGROUND FACILITIES & UTILITY IDENTIFICATION

A. Refer to Metro-North Specification 01_18_01 Protection of Metro-North Underground Utilities

B. Excavation shall be conducted in accordance with 16 NYCRR Part 753. In conformance with 16 NYCRR Part 753, the Contractor must notify the local One Call Center to allow member agencies to mark locations of underground utilities prior to commencing excavation. The Contractor shall take all necessary precautions to identify, locate and avoid contact with existing public utilities.

C. The Railroad maintains its own network of power, phone, signal, and gas utilities. In addition to public utilities, the Contractor shall provide for the location of Metro-North's utilities in accordance with Metro-North's Utility Location Protocol. The Contractor shall notify the Engineer a minimum of one (1) week in advance prior to excavating to allow for the identification of the Railroad's utilities.

D. Should the Contractor uncover, unearth, or otherwise identify a utility that was not previously identified, work impacting the utility shall cease until the utility is identified.

E. Existing utilities shall be taken out of service (i.e. deenergized, depressurized) and tested to verify the same, prior to being spliced into, demolished, removed, or otherwise disturbed.

F. The Contractor shall implement a means of positively identifying existing utilities to be disturbed during the work. A means of identifying the utility as "in service" or "out of service" shall be implemented and made known to project personnel.

G. All new buried utilities shall be properly identified with warning tapes specifically designed and manufactured for subgrade utility identification. Warning tapes shall run the entire length of the utility, and shall be located above the buried utility.

1) The Contractor shall install a warning tape located a minimum of twelve inches (12") inches (300 millimeters) above all conduits, wires, cables, utility pipes, drainage pipes, underdrains, or other facility, unless the excavation's depth, other underground facilities, or other engineering considerations make this minimum separation unfeasible. The warning tape shall be of durable impervious material, designed to withstand extended underground exposure without material deterioration or fading of color. The tape shall be of the color assigned to the type of facility for surface markings and shall be durably imprinted with an appropriate warning message. The tape shall also comply with the specific requirements of the utility that owns the facility.

2) All tapes, unless otherwise directed by the specific utility, shall be detectable to a depth of at least three feet (3') with a commercial radio-type metal locator.

3) Assigned colors are:

   a. Green—Storm and sanitary sewers and drainage systems, including force mains and other non-hazardous materials

   b. Blue—Water

   c. Orange—Communication lines or cables, including, but not limited to, those used in, or in connection with, telephone, telegraph, fire signals, cable television, civil defense, data systems, electronic controls and other instrumentation

   d. Red—Electrical power lines, electrical power conduits and other electrical power facilities, traffic signals and appurtenances and illumination facilities

   e. Yellow—Gas, oil petroleum products, steam, compressed air, compressed gases and all other hazardous material except water

   f. Brown—Other

   g. Purple—Radioactive materials

2.38 EXCAVATION & TRENCHING

A. Excavation shall be conducted in accordance with New York State Code Rule 753 and Section 2.37.

B. Excavations shall be benched and/or sloped as necessary to protect against cave-in or collapse. When the site is not conducive to sloping or benching, appropriate shoring methods shall be implemented.

C. The Contractor shall provide an engineered shoring design to the Engineer. Shoring for excavations within proximity to the tracks shall be designed to meet Cooper E80 loading.

D. Excavations, including trenches, remaining open or inactive for more than one work shift shall be protected. The perimeters of excavations, including trenches, shall be surrounded by high visibility temporary construction fencing. The fencing shall be maintained as necessary throughout the work. Excavations, trenches, and holes within pedestrian or vehicular travel ways that must remain accessible during the work shall be protected by bridges or cover plates. Cover plates shall be secured against displacement. (See Section 2.25 Protection of the Public for requirements).

E. Excavations six feet (6') or greater in depth with slopes steeper than 45 degrees shall also be provided with fall protection.

2.39 BLASTING

A. Prior to blasting all necessary precautions shall be exercised by the Contractor as required by the applicable ordinances, rules and regulations of the authority having jurisdiction. The Contractor shall obtain all necessary permits from the Fire Department of the City of New York for blasting within New York City.

2.40 ELECTRICAL

A. In accordance with 29 CFR 1926.417, the Contractor shall implement Lockout / Tagout procedures.

B. Temporary electrical power and lighting shall be installed in accordance with latest National Electric Code and 29 CFR 1926 Subpart K. Temporary electrical apparatus shall be installed as to not create a hazard to the work force or general public.

C. All temporary electrical power and lighting shall be equipped with Ground Fault Circuit Interrupter (GFCI) protection. All other power sources, including portable generators (regardless of wattage), as well as extension cords plugged into permanent power sources, shall be protected by GFCI at the source.

D. All splices shall be contained within NEMA approved junction boxes.

E. Extension cords shall be inspected regularly for damage (i.e. compromised insulation, missing ground prongs). Damaged cords shall be immediately removed from service and tagged as such or otherwise rendered unusable.

F. Assured grounding shall not be allowed as a means of electrical protection.

G. Energized electrical apparatus shall be adequately segregated, isolated, shielded, or otherwise protected.

2.41 POWDER ACTUATED TOOLS

A. All operators of powder-actuated tools (i.e. Hilti, Ramset) shall be trained in their use by the tool manufacturer. Certificates or other evidence of such training shall be maintained in the field office.

B. The main store of power loads shall be kept in a locked metal ammunition box.

C. The box must bear a permanent sign having the words "DANGER AMMUNITION" in two inch (2") wide letters on a red background

D. At least one (1) 20 lb portable fire extinguisher shall be provided in the storage area

E. The following applies to work within the New York City limits.

1) The Contractor shall obtain a permit from FDNY to store and use power loads at construction sites.

2) Power loads shall be stored in accordance with FDNY requirements

3) Any employee storing, handling, and using power loads must hold a valid E-21 Certificate of Fitness.

2.42 CRANE AND LIFTING EQUIPMENT OPERATION

A. The Contractor shall submit Crane Erection Plans and Lifting Equipment Plans for all construction requiring rigging and lifting and booming of materials and/or equipment, including but not limited to, hoisting and setting of steel members, prefabricated materials, structural panels, and precast concrete. These plans shall be of sufficient in detail and include drawings, calculations, product data sheets/specifications, and identification of components.

B. Cranes shall meet the requirements of the most current ANSI B-30.5 Standard.

C. When a crane or other lifting type of equipment is operated in such a location that any part or its load in any position of boom or swing may come within ten (10) feet of a live power line or contact rail then:

1) The power line or contact rail shall be de-energized,

2) The power line or contact rail shall be insulated or isolated,

3) The crane shall be grounded with Number 2 AWG or larger single conductor, 600 volt covering, and resistance of 25 ohms or less, and

4) The power line and contact rail shall be protected from damage in an approved manner.

D. The Contractor shall notify the Engineer and transmit copies of the following documentation seven (7) days prior to bringing a crane on site:

1) Current Certification of Inspection,

2) License of crane operator,

3) Crane or Lifting Equipment Manufacturer's Load Chart for the Model and configuration of the crane, and

4) Certification (approved by P.E.) of ground support and submittal of grillage and design of ground support.

E. Contractor shall not hoist over a building without notification and permission of the building owner.

F. Modifications or additions, which affect the safe operation of a crane, shall not be made without the manufacturer's written permission.

G. All cranes assembled at the Site shall be inspected and tested by the crane supplier or qualified personnel with proof of inspection and testing transmitted to the Engineer. All lifting devices shall be engineered and tested in the configured working load. The Contractor shall permanently attach or affix, clearly and visibly, the capacity chart of the lifting device.

H. Any welding performed on crane components shall be performed in accordance with the American Welding Society standards or the manufacturer's written specification.

2.43 ERECTION & RIGGING

A. The Contractor shall submit an Erection & Rigging Plan for all construction requiring the rigging and lifting of materials and/or equipment, including but not limited to, hoisting and setting of steel members, prefabricated materials, structural panels, and precast concrete. The plan shall be of sufficient detail and include drawings, calculations, product data sheets/specifications, and identification of components.

B. All rigging shall meet the requirements of the most current ANSI B30.9 Standard.

C. Only qualified riggers shall be employed.

D. Contractor's wire rope, chains, and fiber slings shall have their manufacturer's safe working load identified and attached to each item. The Contractor shall have each sling inspected and certified as prescribed by law and regulations. Slings shall be inspected by a competent person prior to each use. Defective slings shall be taken out of service. Slings exhibiting visible damage, including but not limited to cuts, abrasion, chemical exposure, shall be deemed defective and removed from service. Safety latches shall be used.

E. Only Alloy lifting chains of Grade 8 or better shall be used for lifting purposes.

2.44 WELDING AND THERMAL CUTTING & GRINDING

A. Welding and cutting equipment and operations shall meet the requirements of the most current ANSI Z49.1 Standard, and the requirements of this section. Welders shall retain certifications from the American Welding Society (AWS) and if required, the local entity having jurisdiction.

B. Gas welding and cutting equipment shall be listed by Underwriters Laboratories, (UL) or by Factory Mutual Laboratories, (FM).

C. Prior to any work that generates sparks such as welding, cutting, and burning or grinding the Contractor shall obtain a Hot Work Permit from the Metro-North Office of Fire Prevention. Depending on the location a Permit may be required to be issued *Daily,* per Task or require a *'Daily Signature'* by MNR office of Fire Prevention. See Section 2.46 Fire Protection & Prevention for requirements.

D. In accordance with 1926.354, prior to thermal cutting or welding, existing coatings shall be removed.

E. The Contractor shall transmit a list of certified operators who will be performing cutting and welding, with evidence of their training and certification. Welders and torch operators within New York City shall retain Fire Department of New York (FDNY) Certificates of Fitness.

F. Welding apparatus and equipment shall be inspected daily, prior to use. Defective apparatus and equipment shall not be used and shall be removed from service until repaired or replaced.

G. Prior to the start of work, flammable and combustible materials shall be removed from the area of the hot work. When such materials cannot be removed, or are otherwise fixed, they shall be isolated from heat, flame, sparks, and molten metal by fire retardant materials.

H. Whenever the operator leaves the work area, the cylinder valves shall be closed. Torch valves shall be checked for leaks at the start of each shift. Only friction lighters or other approved devices shall be used to light torches.

I. Splices or repaired insulation on arc welding cables shall not be permitted within ten feet (10') of the electrode holder. Cables shall be positioned so as not to interfere or create obstructions on walkways, scaffolds, stairs or ladders. Splices shall be equal to or greater than the original insulation on the cable.

J. Portable welding screens or shields shall be used to protect other workers and/or the public in the immediate area.

K. Local exhaust and/or mechanical ventilation shall be installed and maintained as necessary to prevent accumulation of fumes within the work area and contamination of adjacent occupied areas.

2.45 COMPRESSED GAS CYLINDERS

A. All compressed gas cylinders shall be stored, used, and handled in accordance with the Compressed Gas Association guidelines, NFPA Standards, the requirements of the Metro-North Office of Fire Prevention, and the requirements of this section. Prior to on site storage, the Contractor shall inform the Metro-North Office of Fire Prevention of their intent to store compressed gas on site.

B. Each compressed gas cylinder shall be considered to be either in transport, storage, or use. The following conditions apply:

1) Gas cylinders shall be clearly identified as to contents.

2) Compressed gas cylinders shall be transported and used in portable welding carts with the cylinders securely chained or clamped to the cart. An operable dry chemical fire extinguisher, rated not less than ten pounds (10 lbs) of chemical shall be mounted on each portable welding cart in use.

3) Manifolds shall be removed when the cylinders are not in use.

4) Valve protector caps shall be screwed on in place except when the cylinders are in use.

5) Compressed gas cylinders shall be protected from sources of heat.

6) Cylinders shall be secured upright on a firm base and against toppling via a chain, steel cable, or non-combustible material that is capable of withstanding fire/open flame without burn through.

7) No more than five (5) cylinders of each gas type shall be stored on site. All gas cylinders not in actual use, or proposed for immediate use, shall be removed from the site and stored off site. Excessive or unreasonable storage of cylinders on the site is prohibited. Improperly stored cylinders shall be immediately removed from the work area. Empty gas cylinders shall be removed prior to or at the same time replacement cylinders are brought on site.

8) Compressed gas cylinders in storage (full or empty) shall be stored in cylinder cages or sheds constructed of noncombustible materials specifically designed for such purpose. Storage areas shall be well ventilated and without electric lights or fixtures and shall be located as far from other buildings as is practicable.

9) The cylinder cages/sheds shall be secured (ie. padlocked) as to prevent theft or tampering with the cylinders.

10) Storage areas shall be labeled.

11) Different types of gases shall not be stored together, or without proper separation, except when in use and when such proximity is required.

2.46 FIRE PROTECTION AND PREVENTION

A. The Contractor is responsible for providing all labor, material, and equipment for fire protection during the work including trained and qualified fire watches, fire extinguishing equipment, shields, screens, and protective blankets. The Contractor shall maintain fire protection equipment throughout the project.

B. All materials, whether to be used for temporary or permanent construction, shall be fire resistant, and when possible, non-combustible materials shall be chosen over combustible materials. Each temporary structure shall be constructed of fire resistant or fire retardant treated material. All materials (i.e. lumber, plywood) shall be fire retardant treated and contain the manufacturer's stamps evidencing such. If the stamps are illegible or otherwise not provided, the material shall be immediately removed from the premises and replaced at no additional expense to Metro-North. On site application of fire retardants by the Contractor is prohibited, except when the material is not commercially available pretreated from the manufacturer.

C. Temporary barriers within occupied facilities used to segregate work areas from non-work areas shall be constructed as to provide a two (2) hour fire rating.

D. Combustible wastes/debris shall be removed on a regular basis as to not pose a fire hazard. The frequency for removal shall be based upon the rate of accumulation, but at no time shall exceed weekly removal from the premises.

E. The on site storage of flammable materials is prohibited without the prior authorization of the Metro-North Office of Fire Prevention. Flammable materials shall be stored in approved containers in accordance with NFPA guidelines and requirements of the local fire authority. Flammable Liquids shall be stored in Factory Mutual (FM) approved safety cans equipped with self-closing lids and flame arrestors. Flammable or combustible liquids shall be stored within approved containers within closed, approved flammable storage cabinets. Flammable materials that will be stored on site in exterior locations shall be stored in approved containers, within flammable storage cabinets. Flammable materials to be stored within facilities shall be stored in approved containers, within flammable storage cabinets, located in areas equipped with fire suppression.

F. Smoking is prohibited within all Metro-North facilities, including construction work areas.

G. Open flames and smoking shall be prohibited within one hundred feet (100') of explosive or flammable materials.

H. The Contractor shall retain a Hot Work Permit, available through the Metro-North Office of Fire Prevention, for all work that generates heat, sparks, molten metal/slag, or requires an open flame. Such work includes but is not limited to, grinding, brazing, soldering/sweating, gas and electric welding, cadwelding, torch cutting/burning, and temporary heat.

I. The Contractor shall provide appropriately trained personnel to act as Fire Guards or Fire Watches. Fire Guards/Watches within New York City shall retain Fire Department of New York (FDNY) Certificates of Fitness. Fire Watches shall be familiar with hazards that exist in the work area, and be trained in the operation of each type of fire extinguisher on the work site. Fire Watches shall remain at the site of the hot work for the duration of the work and a minimum of sixty (60) minutes after completion of the hot work. The Contractor shall transmit a list of certified fire watch personnel, and evidence of their training and certification.

J. Fire extinguishers rated at 20 lbs ABC or larger shall be in the immediate area whenever welding or cutting is being carried out. In addition, water shall be used to pre-dampen combustible materials prior to the start of the hot work. If available, a hose connected to a suitable water supply shall be maintained at the ready adjacent to the area of hot work. In the absence of a water supply, a pressurized water fire extinguisher shall be provided.

K. In addition to notifying the Engineer, the written permission of the water utility shall be obtained before shutting off water servicing a fire hydrant.

L. The Contractor shall not block roadways, hydrants, post indicator valves, or access to firefighting equipment without the prior notification and approval of the Metro-North Office of Fire Prevention, the local agency having jurisdiction over fire prevention/protection, and the Engineer.

M. Work stoppage and shutdown of equipment shall be mandatory upon alarm of fire. Personnel shall report to the designated assembly area(s).

2.47 SCAFFOLDS

A. Scaffolds to be utilized during the work shall comply with the requirements of 1926 Subpart L and/or the local governing body having jurisdiction (i.e. NYCDOB); the more stringent requirements shall apply. The Contractor shall be responsible for retaining all permits and licenses and associated fees for scaffold erection and use.

B. Scaffolds shall be designed and constructed in accordance with the intended use. The Contractor shall provide a submittal for all scaffolds to be constructed on site. Site constructed scaffolds shall be designed, signed and stamped by a professional engineer. Scaffolds shall be constructed in accordance with the design submittal. The submittal shall include the design parameters such as duty rating, live and dead loads, and wind load, plan, elevation, and section views of the system, identification of components, and foundation, baseplate, and anchoring systems. Modifications required due to field conditions shall be reviewed and approved by the designer.

C. Scaffolds shall be equipped with protective devices suitable for the type of work being performed. This may include shields, barriers, mesh, netting, etc. as to contain dust, debris, and provide protection from falling objects. The design of the scaffold shall take into

account the protection of non-project personnel and property, including but not limited to, the public, customers, railroad employees, adjacent properties and structures, and vehicular and railroad equipment.

D. Scaffolds erected over and/or adjacent to the railroad shall be constructed as to provide protection of railroad equipment operating below and/or adjacent to the scaffold. Unless otherwise directed or local requirements are more stringent, scaffolds erected over and/or adjacent to the railroad shall be constructed as to withstand a one hundred mile per hour (100 mph) wind load.

E. In accordance with 29 CFR 1926.454(a), persons erecting and utilizing scaffolds shall have completed training in the subject area. Documentation evidencing such training shall be submitted to the Engineer.

F. Persons erecting and/or using scaffolds within New York City shall have completed the applicable Department of Buildings training. Documentation evidencing such training shall be submitted to the Engineer.

2.48 FALL PROTECTION

A. The Contractor shall provide fall protection for all work exposing persons to an unprotected fall greater than six feet (6'), including steel erection. Excavations six feet (6') or greater in depth with slopes steeper than forty-five degrees (45^{o}) shall also be provided with fall protection. In the event that providing this protection is not feasible or creates a greater hazard, the Railroad may at its discretion allow for a task specific variance from this policy. Requests for a task specific variance shall be transmitted in writing with justification for relief. The Railroad's acceptance must be received in writing prior to starting the specific task under the variance.

B. The Contractor shall provide a site specific Fall Protection Plan. The plan shall identify the method(s) of fall protection to be implemented at the site and shall be congruent with the nature of the work and anticipated usage. The Contractor shall provide a submittal including product data/catalogue cut sheets, engineering calculations, a procedure detailing the installation, and a procedure for its usage. Personal fall arrest systems (i.e. anchorages, horizontal and vertical lifelines) shall be designed and stamped by a professional engineer.

C. For work on railroad bridges the fall protection requirements of 49 CFR 214.101 shall be followed.

D. In accordance with 29 CFR 1926.503(a), persons exposed to fall hazards shall have completed training in the subject area. Documentation evidencing such training shall be submitted to the Engineer.

2.49 CONFINED OR ENCLOSED SPACES

A. The Contractor shall adhere to all requirements for entering a Confined Space as listed in OSHA 29 CFR 1910.146 & 1926.1207. Enclosed Spaces as defined in 29 CFR 1910.268-.269 shall be treated as Confined Spaces.

B. The Contractor shall prepare a Confined Space Entry Program identifying the confined spaces to be entered and procedures to be followed. The program shall be submitted to the Engineer for review prior to engaging in confined space entry.

C. Persons entering confined spaces (i.e. entrants) and/or persons monitoring confined space entry (i.e. attendants), shall be trained in accordance with the OSHA standard. Documentation evidencing such training shall be provided to the Engineer prior to engaging in confined space entry tasks.

2.50 MOTOR VEHICLES, TRACK VEHICLES / HI-RAIL EQUIPMENT & CONSTRUCTION EQUIPMENT

A. Company identification shall be clearly displayed on each vehicle.

B. Vehicles shall not block access for emergency equipment.

C. Pedestrians shall have the right of way at all times. The speed limit on Railroad property is 5 MPH unless otherwise posted.

D. The Contractor is to have all High-Rail equipment inspected in accordance with Metro-North Railroad (MNR) Maintenance of Way Department (MOW) requirements. The engineer will provide the inspection requirements. This inspection is to occur prior to MNR's onsite High-Rail inspection conducted at Metro-North Railroad North White Plains MOW Facility, and prior to use on MNR tracks. The Contractor shall notify the Engineer a minimum of three (3) weeks prior to its scheduled use. The Contractor shall coordinate inspection of the high-rail vehicle at the North White Plains Maintenance Facility. The equipment shall not be used on track until passes inspection. This inspection is required quarterly or as directed by the Engineer.

E. Submit a copy of the Manufacture Specifications and Operations and Maintenance Manual for both Hi-Rail Gear and Equipment.

F. Modification of equipment affecting its safety shall not be performed unless approved in writing by the manufacturer.

G. All motor vehicle and construction equipment operators shall be trained for the type of vehicle or equipment they operate. Upon request, evidence of such training shall be provided to the Engineer.

H. Vehicles shall be equipped with backup lights and a reverse signal alarm. The alarm shall produce a 0.2 to 0.5 second audible warning within the initial three feet of backward movement of the vehicle on which it is mounted and at regular intervals thereafter of not more than three seconds, throughout the backward movement. The alarm shall automatically cut out when backward movement ceases. Sound intensity shall range from 90 to 100 dbs. at a distance of five feet from the alarm. Actuation shall be automatic by direct connection to any part of the equipment that moves or acts in a manner distinctive only of rearward movement of the vehicle, with no manual controls between the source of actuation and the alarm.

I. Glazing within cabs of construction equipment shall be intact and free from cracks or other defects. Equipment with broken glazing shall be removed from service until repaired. Glass shall be cleaned as necessary to maintain operator's visibility.

J. Only properly identified contactor work vehicles, and equipment that are necessary to directly support the construction activities shall be permitted adjacent to the actual construction operations.

K. Construction employees shall park personal vehicles only in designated areas of the work site and shall enter the site only at points specifically designated by the Engineer. Personal vehicles will not be permitted adjacent to, or allowed to pass through, the areas of construction without Engineer's special permission and proper identification.

L. Vehicle and equipment operators shall inspect and test essential controls, safety equipment, and safety devices before placing the vehicle or equipment in use. The Contractor shall conduct daily safety and equipment inspection of motor vehicles, hi-rail and construction equipment. The Contractor is to use the 'Contractor Daily Hi-Rail Vehicle Inspection' provided by the Engineer or found in the **'Work Effecting the Railroad'** Specification. Equipment, whether owned, leased, or rented, is to be removed from service if unsafe.

M. High-Rail equipment operators shall be trained in the operation of the vehicle and Hi-Rail Gear. Submit a list of Qualified Operators for the project with credentials, to include but not limited to:

   a. CDL (Commercial Driver's License)

   b. Previous experience working with Hi-Rail equipment (list RR's with Hi-Rail experience, date of work, type of equipment trained to operate).

   c. Document Training or Instructions given by 'House Mechanic' if equipment is owned or instruction received from the Rental Equipment Vendor Mechanic.

   d. Operator to be responsible to ensure Hi-Rail Gear is fully engaged.

N. High-Rail equipment shall be operated in accordance with Metro-North Railroad's Operating Rules and General Safety Instruction applicable to operation of track equipment. A Metro-North Railroad Pilot / Conductor Flagman must always be present during the movement and operation of High-Rail equipment. Contractor's Safety Engineer or Competent Person will lead a Hi-Rail Job Safety Briefing with all operators of rail mounted equipment. The safety briefing will be documented on the provided "Contractor Daily Hi-Rail Job Safety Briefing" provided by the Engineer or found in the **'Work Effecting the Railroad'** Specification. Equipment, whether owned, leased, or rented, is to be removed from service if unsafe.

PART 3 - MATERIAL

Not Used

PART 4 - EXECUTION

Not Used

PART 5 - MEASUREMENT AND PAYMENT

5.01 MEASUREMENT

No measurement will be made for this work.

5.02 PAYMENT

A. No separate payment will be made for the work described in this specification. The costs associated with this work shall be included in the lump sum.

END OF SECTION

Metro-North Railroad

Safety, Health, & Environmental Control Plan (SHECP)
SUBMITTAL OUTLINE & CHECKLIST

The following outline and checklist is presented as an aid to assist Contractors in preparing their Safety Health and Environmental Control Plan (SHECP). Please refer to the specifications for details on SHECP requirements. ***This checklist shall be completed by the Contractor and submitted with the SHECP. Failure of the Contractor to complete this checklist and submit it along with the SHECP shall be grounds for rejection of the submittal.***

Contract Number / Project Description	
Contractor	

(Check One)	☐ Initial Submittal ☐ Revised Submittal	Revision Number Revision Date	

	Description	Included-Page #	Not Applicable	Comments / Notes Identify Revised Sections-Revision Number & Date
GENERAL				
☐	Cover page including name of contractor, contract number, contract title, revision number, revision date, and name and signature of Safety Engineer			
☐	Table of Contents providing section numbers, title or description of the section contents, the page number of each section, list of attachments, and the revision number and revision date of each section.			
☐	A summary of the scope of work to be completed under the contract			
☐	A listing of the known and anticipated hazards to be encountered during the work *(NOTE: This section is intended to be general in nature. It is intended that the Job Hazard Analyses/Safe Work Plans will identify the specific construction activities, associated hazards, controls, and the PPE and specific training required)*			
☐	A Safety Policy Statement signed by company officer			
☐	The company's policy pertaining to the periodic evaluation, improvement and revision of the Safety Program			
ROLES & RESPONSIBILITIES				
☐	Organizational chart of Contractor and Subcontractor personnel responsible for implementing the SHECP. Identify the duties and responsibilities of managers, supervisors, and employees			
☐	Description of the relationship between the Prime and Subcontractor(s) and the responsibilities for management of site safety			
☐	Description of how the company promotes employee involvement and participation in the Safety Program			
☐	Identify the responsibilities of individuals/employees (i.e. to comply with safety rules and requirements, to work safely/follow safe work practices, to use appropriate protective equipment properly, responsibility, to report unsafe practices and conditions, to report injuries and illnesses immediately)			

Safety, Health, & Environmental Control Plan (SHECP)
SUBMITTAL OUTLINE & CHECKLIST

	Description	Included-Page #	Not Applicable	Comments / Notes Identify Revised Sections-Revision Number & Date
☐	Identification of the Safety Engineer including duties and responsibilities			
☐	Identification of the Safety Supervisor including duties and responsibilities			
☐	Identification of the Competent Person(s) for each of the construction types or specialties			
☐	Description of the Disciplinary Procedures for Violations of Safety Rules, Procedures for Handling of Employees / Subcontractors Failing to Abide By Safety Requirements			
☐	Submittal of Alcohol and Drug Program to FRA for approval and copy to MNR			
EMPLOYEE TRAINING & INFORMATION				
☐	Description of how the company trains its employees in accordance with the specific training requirements set forth in the OSHA standards			
☐	Identify how the company trains employees to work safely and use proper protective equipment			
☐	Requirement for OSHA 30 hr Construction Safety training for all management and supervisory staff within the last (5) years			
☐	Requirement for all laborers, mechanics, and craftsmen to have completed the OSHA 10 hr Construction Safety training within the last (5) years			
☐	Requirement for all on site employees to complete Metro-North Roadway Worker / Contractor Safety Orientation Training			
☐	Description of the company's Drug & Alcohol Policy and how the company intends to comply with Metro-North's Fitness for Duty clause as per FRA.			
☐	Provide Drug & Alcohol Plan submitted to FRA under the 49 CFR 219 Reg. [copy of approval once received]			
☐	Description of the Site / Project Safety Orientation to be provided to each employee (include outline and record of training to be signed by each employee)			
☐	Daily Job Safety Briefings			
☐	Weekly Worker Safety Meetings (i.e. Tool Box Meetings)			
SAFETY RULES & PROCEDURES				
☐	Review / highlight Metro-North Specific Safety Requirements			
☐	Review / highlight the specific requirements for work in Grand Central Terminal (for projects within GCT only)			
☐	Description of Metro-North's minimally required PPE			
☐	Warning, Caution, & Informational Signage			
☐	A description of the procedures to be implemented to protect non-project personnel (i.e. general public,			

Safety, Health, & Environmental Control Plan (SHECP)
SUBMITTAL OUTLINE & CHECKLIST

	Description	Included-Page #	Not Applicable	Comments / Notes Identify Revised Sections-Revision Number & Date
	Metro-North employees and customers) including, flagging/escorting moving equipment, separation of work areas from non-work areas, establishing exclusion and controlled access zones, construction fencing, barricades, and barriers			
☐	Policies pertaining to the use of Cell Phones, PDA's & Personal Devices			
☐	Work Site Access & Egress			
☐	Housekeeping			
☐	Slip/Trip/Fall Hazards and Abatement			
☐	Maintenance of Walking Surfaces for Snow & Ice			
☐	Hazard Communication (HAZCOM) / Chemical Safety - Procedure for identification and labeling of products, control of products and materials containing hazardous components, including provisions for maintenance of Material Safety Data Sheets (MSDS)			
☐	Procedures for the identification / uncovering of suspect hazardous materials (asbestos, lead, PCB)			
☐	Overexertion, Soft tissue & Back related injuries			
INCLUDE SECTIONS ON THE FOLLOWING AS APPLICABLE TO THE WORK				
☐	Protection of Underground Facilities (12 NYCRR Part 753 - Call Before You Dig, Metro-North Utility Identification Protocol)			
☐	Marking, Placarding & Labeling			
☐	Sanitation			
☐	Clearing & Grubbing			
☐	Demolition			
☐	Heavy Equipment & Material Handling Equipment			
☐	Motor Vehicles			
☐	Hi-Rail Vehicle(s)			
☐	Excavation & Trenching			
☐	Blasting			
☐	Pile Driving			
☐	Concrete & Masonry / Reinforcing Steel			
☐	Steel Erection			

Safety, Health, & Environmental Control Plan (SHECP)
SUBMITTAL OUTLINE & CHECKLIST

	Description	Included-Page #	Not Applicable	Comments / Notes Identify Revised Sections-Revision Number & Date
☐	Lock Out / Tag Out			
☐	Temporary Electric			
☐	Temporary Lighting			
☐	Arc – Flash Protection			
☐	Traction Power - 3rd Rail / Catenary			
☐	Cranes, Hoists, & Lifting			
☐	Rigging			
☐	Hand Tools			
☐	Power Tools			
☐	Powder Actuated Tools			
☐	Ladders & Stairways			
☐	Scaffolds			
☐	Fall Protection			
☐	Confined Space Entry			
☐	Ventilation			
☐	Air Pollution / Dust Control			
☐	Silica			
☐	Respiratory Protection			
☐	Hearing Conservation			
☐	Painting			
☐	Asbestos & Lead Abatement & Health Protection			
☐	Fire Prevention & Protection			
☐	Handling, Containerization, & Storage of Flammable Materials/Liquids			
☐	Metro-North Hot Work Permitting Procedures			
☐	Burning & Welding			
☐	Compressed Gases			
☐	Temporary Heat			
☐	Marine Operations			

Safety, Health, & Environmental Control Plan (SHECP)
SUBMITTAL OUTLINE & CHECKLIST

	Description	Included-Page #	Not Applicable	Comments / Notes Identify Revised Sections-Revision Number & Date
☐	Underwater & Dive Operations			
☐	Working Over Or Near Water			
☐	Personal Protective Equipment (PPE)			
☐	Hi-Rail Vehicle Information			
RISK ASSESSMENT / HAZARD ANALYSIS				
☐	Description of the system, process, or set of procedures that will be implemented for hazard identification / assessment and prevention / control			
☐	Description of the Safe Work Plans / Job Hazard Analysis process (ie. preparation and implementation)			
☐	Daily Site Safety Inspections – Description of the system for regular inspection/auditing of work areas for hazards and implementation of controls			
☐	Daily Final Inspection of Work Site			
☐	Monthly Site Safety Audits			
☐	Identification and Handling of Unsafe Conditions			
SITE / PROJECT SECURITY				
☐	Procedures for Identification of Project Personnel			
☐	Provisions for accounting for on site personnel (i.e. Sign In / Sign Out Log)			
☐	Provisions for Accessing Secure Sites			
☐	Special provisions for work in GCT, sign-in/sign-out with the Station Masters Office			
☐	Provisions for Site Security (i.e. fencing, barricades, guard service)			
☐	Procedures to prevent unauthorized personnel from entering the site			
☐	Prevention of vandalism and theft			
EMERGENCY PREPAREDNESS				
☐	Emergency Contacts – Project (comprehensive listing to include all project personnel and involved parties)			
☐	Emergency Contacts – Site (police, fire, medical, hospital, Metro-North, MTA Police, Operations Command Center/Rail Traffic Controllers, etc. for posting on site and use by on site project personnel)			
☐	Include site specific information (i.e. project address) that will be provided to 911 emergency dispatch / first responders to assist them in being able to quickly locate the site			

Safety, Health, & Environmental Control Plan (SHECP)
SUBMITTAL OUTLINE & CHECKLIST

	Description	Included-Page #	Not Applicable	Comments / Notes Identify Revised Sections-Revision Number & Date
☐	Hospital / Medical Facility Information (addresses, phone numbers, maps, driving directions for nearest hospitals)			
☐	Procedures for Responding to Medical Emergencies			
☐	Provisions for First Aid, CPR, AED			
☐	Procedures to protect against Bloodborne Pathogens			
EVACUATION PLANNING				
☐	A procedure for initiating and managing evacuations			
☐	Identification of the available means of egress			
☐	Establishment of primary and secondary assembly (i.e. muster) areas			
☐	A system by which each individual can be accounted for in the event of an evacuation (i.e. Sign In / Sign Out Log)			
☐	A procedure for re-entry			
INCIDENTS, ACCIDENTS, & INJURIES				
☐	Procedures for the Handling and Reporting of Incidents, Accidents, and Injuries (*reference Metro-North Capital Programs Incident Reporting)*			
☐	Description of the process to be used to investigate Incidents, Accidents, and Injuries including a process for identifying Root Cause(s)			
☐	Description of the procedure for handling Near Misses / Close Calls			
☐	Recordkeeping & Reporting Injuries & Illnesses (29 CFR 1904)			
RECORDKEEPING				
☐	Procedures for the periodic review and revision of the SHECP.			
☐	Procedures for recordkeeping including the organization and maintenance of safety related documentation			
SITE SPECIFIC SAFETY PLANS AS APPLICABLE TO THE WORK				
☐	Asbestos Abatement			
☐	Lead Abatement			
☐	Protection of Metro-North Employees, Customers, and the General Public			
☐	Scaffold Plan			
☐	Fall Protection Plan			
☐	Confined Space Entry / Permitting			

Safety, Health, & Environmental Control Plan (SHECP)
SUBMITTAL OUTLINE & CHECKLIST

	Description	Included-Page #	Not Applicable	Comments / Notes Identify Revised Sections-Revision Number & Date
☐	Crane, Rigging & Lifting Plans			
☐	Maintenance & Protection of Traffic (MPT) / Traffic Control Plans			
SUPPORTING DOCUMENTATION				
☐	Emergency Contact List (Project)			
☐	Emergency Contacts (Site)			
☐	Record of Subcontractor Acceptance of SHECP			
☐	*Roadway Worker Procedures for Contract Employees* (Metro-North Document)			
☐	Record of Metro-North Roadway Worker Safety Training			
☐	Evidence of Employee Training (OSHA 10 hr, Fall Protection, Scaffold Erection & Use, Confined Space)			
☐	Resume(s) / Qualifications of Safety Engineer & Safety Supervisor			
☐	Record of Employee Site/Project Safety Orientation			
☐	Daily Sign-in/Sign out Log			
☐	Safe Work Plan			
☐	Record of Worker Safety Meeting (date, topic(s) of discussion, and attendees)			
☐	Daily Safety Report			
☐	Monthly Site Safety Audit Report			
☐	Reports / Forms for documentation and investigation of Incidents, Accidents, and Injuries			
☐	*Capital Programs Incident Reporting* (latest revision) (Metro-North Document)			
☐	Material Safety Data Sheets			
☐	Record of Employee Misconduct / Notice of failure to abide by safety requirements			

Prepared By:

Printed Name: _____ **Signature:** _____ **Date:** _____

SAFE WORK PLAN

SECTION 1 – General Information			
Contract / Project Description:		SWP No.:	
General Contractor:		Date:	
Contractor Performing Work:		Revision No.:	
Primary Task:			
Method of Construction:			

Equipment:	

SECTION 2 – Development Team					
Prepared By:	**Position/Title**	**Date**	**Reviewed By:**	**Position/Title**	**Date**

SECTION 3 – Competent Person(s) Assigned			
Competent Person	**Discipline**	**Competent Person**	**Discipline**

SAFE WORK PLAN

SECTION 4 – Safety Analysis				
	Work Element(s)/Sub Tasks:	**Hazard Description**	**Hazard Control/Accident Prevention**	**Specific Training & PPE Required**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

SECTION 5 – Implementation / Review with Work Force					
Print Name	**Signature**	**Date**	**Print Name**	**Signature**	**Date**

Metro-North Railroad

Contract Employee Sign In / Sign Out Log

Page _____ of _____

Emergency Numbers	MTA Police	Operations Command Center / Rail Traffic Controller	GCT Station Master's Office / Fire Command Center
	(888) 682 - 9117 or (212) 878 - 1000	(212) 340 - 2050	(212) 340 - 3191 / 3192

Contract Number / Project Description	**Contract #: ????? / Project Name: ?????**	**Contractor (Prime)**	**Or Consultant in the field**
Work Location *(Give this description to emergency services)*	**Provide Access Location if no Address**	**Field Office Location / Phone**	

	Day (circle)	Date	Time		Day (circle)	Date	Time
Start	M T W H F SA SU			**Finish**	M T W H F SA SU		

Contacts	Contractor's Site Representative	Contractor's 24 hr Emergency	Metro-North Project Manager	Metro-North Representative
Name				
Cell Number				
Office Number				

Metro-North Authorization Print Name: _____ Signature: _____

Name (Print)	MNR RW Card #	Company	Date	Time On Site	Signature	Date	Time Off Site	Signature
MNR Conductor Flag				MNR Conductor Flag				
Reporting Location for Next Shift:								

Metro-North Railroad

Contract Employee Sign In / Sign Out Log

Page _____ of _____

Name (Print)	MNR RW Card #	Company	Date	Time On Site	Signature	Date	Time Off Site	Signature

CAPITAL PROGRAMS
MONTHLY PROJECT SAFETY AUDIT WORKSHEET

Project Name: _____

Date: _____ **Contract No.:** _____

Audit Team:
Contractor: _____ ***3rd Party Const. Mgmt.:*** _____

Metro-North:_____

		YES	NO	NA
	ADMINISTRATIVE			
1.	The contractor's Health & Safety Plan is maintained in the project office and available for inspection			
2.	Have all subcontractors currently working on the project provided written acknowledgement / acceptance of the project SHECP?			
3.	Have all contractor personnel that are physically working at the project site completed Metro-North's Contractor Roadway Worker Safety Orientation? [documented]			
4.	Are Worker Safety Meetings (i.e. Tool Box Meetings) being completed at least weekly and are records of the same maintained in an organized manner (i.e. file or binder in chronological order)?			
5.	Are Sign-in / Sign-out Logs being transmitted to the Engineer on a regular (i.e. daily, weekly or monthly) basis?			
6.	Safe Work Plans / Job Hazard Analyses on site signed and available for review?			
7.	OSHA Poster			
8.	OSHA 300 and 300A Logs are posted			
9.	NYSDOL Postings			
10.	OSHA 10 Hr Construction Safety Up to date for workers [documented]			
11.	Project Emergency Contact List posted in field office & at Job Site			
12.	Emergency Phone Numbers posted on job site for work force			
13.	Emergency Phone Numbers posted at multiple locations throughout project site to facilitate quick and easy identification by work force			
14.	Evacuation locations posted or noted on SWP's			
15.	Contractor employees are being provided a Site Safety Orientation upon commencing work at the site			
16.	Records of the work force having completed Site safety Orientations are being maintained			
17.	Records of Worker Safety Meetings / Tool Box Meetings are being maintained			
18.	Worker Safety Meetings / Tool Box Meetings are being held at least once a week			
19.	Personnel on site have completed Metro-North Roadway Worker Procedures for Contract Employees within a year of today			
20.	The work force is being provided effective Job Safety Briefings at the beginning of each shift or as conditions / tasks change			
21.	All accidents and injuries are being appropriately recorded on the OSHA 301 forms			
22.	Emergency Locations established & reviewed			
	FIRST AID / CPR / AED			
23.	An individual trained in first aid is present on the jobsite during all working hours			
24.	An individual trained in cardio pulmonary resuscitation (CPR) is present on the jobsite during all working hours			

CAPITAL PROGRAMS
MONTHLY PROJECT SAFETY AUDIT WORKSHEET

		YES	NO	NA
25.	An individual trained in the use of the automatic external defibrillator (AED) is present on the jobsite during all working hours			
26.	An AED is present on the jobsite			
27.	The AED is being checked and maintained by the contractor			
28.	First aid kit is available on the project site			
29.	Based upon the size of the project site, are an adequate number of first aid kits deployed			
30.	First aid kit is adequately sized to the work force			
31.	First aid kit(s) is adequately maintained (i.e. maintained in good condition, supplies are replenished, expiration dates on supplies have not exceeded)			
	HAZCOM / SDS			
32.	Safety Data Sheets (SDS) are available for products currently on the project site			
33.	SDS are organized as to allow quick and easy identification in the event of an emergency Or attached to the SWP.			
34.	Regulated/Haz. Waste is labeled and stored properly			
	SANITATION			
35.	Toilet facilities are provided at jobsite			
36.	The number of toilet facilities provided is commensurate with the size of the work force			
37.	Toilet facilities are being maintained in a sanitary condition / are adequately serviced			
38.	An adequate supply of potable water is provided at the jobsite (wash station)			
39.	Containers (i.e. disposable cups) are provided for drinking water			
40.	Adequate containers are provided for personal garbage, food wastes, drink containers			
41.	Personal garbage, food wastes, drink containers are removed from the jobsite at regular intervals as to not attract vermin and/or insects			
42.	Lavatory facilities are provided for employees working with materials, products or chemicals where regular washing is required or recommended			
43.	Lavatories are supplied with an adequate supply of tepid water			
44.	Lavatory facilities are being maintained in a sanitary condition / are adequately serviced			
	HOUSEKEEPING			
45.	Work site is being maintained clean and free of dangerous waste and material			
46.	Combustible wastes are being removed from the site on a regular schedule as to limit fire load (temp storage of combustibles to be protected, i.e. fire blankets)			
47.	Scrap materials are discarded in appropriate containers or stored in an orderly fashion			
48.	Containers are provided for construction wastes			
49.	Containers for construction wastes are being empty / replaced as necessary to prevent overfilling / overflowing			
50.	Hallways, stairways, walkways, pathways, and work areas are being maintained free of materials, scrap lumber, rebar, pipe, hoses, cables, wires, tools, garbage or other debris			
51.	No spills of liquids, oils, grease, or other slippery materials			
52.	Nails, screws or other protruding objects that may pose snag, puncture or impalement hazards are being removed or rendered non-protruding			
53.	Nails removed from scarp lumber			
54.	Bolts, nuts, or other protuberances on temporary construction are adequately protected / padded			
	SPILL PREVENTION & RESPONSE			
55.	Spill Prevention and Response Plan maintained within project field office			
56.	A spill control/containment kit is available on the jobsite			
57.	The spill control/containment kit is adequately maintained			
58.	Spills are quickly and adequately cleaned up			
59.	Pipe threading cuttings and lubricant are being collected/contained			

CAPITAL PROGRAMS
MONTHLY PROJECT SAFETY AUDIT WORKSHEET

		YES	NO	NA
60.	Liquids stored on jobsite are stored in sealed containers			
61.	Secondary containment provided for liquids stored on site			
	LIGHTING			
62.	Work areas are adequately illuminated			
63.	If existing site lighting was disconnected as a result of construction activities, sufficient temporary lighting has been provided			
64.	Temporary lighting is GFCI protected			
65.	Light bulbs are shielded within fixtures or enclosed within cages (i.e. stringers)			
66.	Temporary wiring is suspended by ceramic or other insulators			
	FIRE PREVENTION			
67.	Work force has been trained in the emergency procedures in the event of a fire			
68.	Work force has been trained in the proper use of fire extinguishers			
69.	Work force knows the locations of fire extinguishers throughout work areas			
70.	20 lb 2A fire extinguisher is provided for every 3,000 sqft of space for interior work areas			
71.	20 lb 2A fire extinguisher is within 100 feet of all work areas			
72.	Firefighting equipment is readily accessible and maintained in good condition			
73.	Hot Work Permit is provided for all work involving use of an open flame, temporary heat, welding, torch cutting, grinding, or other spark generating activity & HWP Posted			
74.	Temporary heating devices are not of the resistive element type			
75.	Portable heaters are being used safely and away from combustibles			
76.	Designated fire guard is present during hot work operations			
77.	Fire guards hold current FDNY Certificate of Fitness (within New York City limits only)			
78.	Torch operators hold current FDNY Certificate of Fitness (within New York City limits only)			
79.	Smoking prohibited in fire hazard areas			
80.	Flammable and combustible liquids are marked / identified			
81.	Flammable and combustible liquids are stored within self closing safety cans			
82.	Flammable and combustible liquids are secured against vandalism within flammable material cabinets during non-work periods			
83.	Placards posted on exterior of tool storage sheds/containers for flammables stored within			
84.	Rags soaked with oil, solvents, or other flammables possible of spontaneous combustion are properly containerized or disposed of			
85.	Have fire drills for workers been held.			
	EXCAVATION			
86.	Excavations protected by guardrails, fences, or barricades if not readily seen due to plant growth or other visual barriers			
87.	Competent person with knowledge of excavation hazards, pertinent OSHA regulations, and soil analysis on hand			
88.	Excavation inspected daily by a competent person before workers enter			
89.	Are employees trained in recognition of hazards			
90.	Materials and spoil piles are stored at least two feet from trench or excavation			
91.	Equipment is a safe distance from edge of trench/excavation			
92.	Ladders provided every 25 feet in trench			
93.	Excavations are shored or sloped back for excavations greater than five feet deep			
94.	Proper utility services identifications and locations made			
	FALL PROTECTION			
95.	Fall Protection Training records for employees [for employees using FP – and readily available for review]			

CAPITAL PROGRAMS
MONTHLY PROJECT SAFETY AUDIT WORKSHEET

		YES	NO	NA
96.	Holes and openings are protected and marked appropriately			
97.	Safety rails/cables are secured properly			
98.	Employees exposed to fall hazards are protected from falls			
99.	Fall protection equipment is appropriate for working height			
100.	Employees below protected from falling objects			
	PERSONAL PROTECTIVE EQUIPMENT (PPE)			
101.	Adequate supplies of PPE are being maintained on the jobsite			
102.	Hard hats			
103.	High visibility traffic vests			
104.	High visibility traffic vests are equipped with tear away closures			
105.	Protective eyewear			
106.	Face shields in use when danger of harmful chemical or physical contact exists			
107.	Work shoes / boots			
108.	Gloves			
109.	Hearing protection			
110.	Respiratory Protection Training for employees [for employees requiring RP – records to be kept & readily available for review]			
111.	Respiratory Protection Program maintained within project office			
112.	Individuals wearing respirators have documentation evidencing medical clearance to wear a respirator			
113.	Respiratory protection in accordance with SDS or appropriate for type of exposure (i.e. HEPA or N95 for particulates, organic vapor for VOC's)			
114.	Non-disposable respirators are properly cleaned, stored & maintained			
	THERMAL CUTTING / WELDING			
115.	Welders / Burners are equipped with tinted faceshields, leather gloves with gauntlets, welding jacket, respiratory protection			
116.	Paint removed prior to burning or welding (1926.354)			
117.	Cut resistant gloves used by those working with sharps			
	ENGINEERING CONTROLS			
118.	Dust suppression methods appropriately implemented (i.e. wetting, ventilation)			
119.	Implementation of Silica Dust Controls as per OSHA 1926.1153			
120.	Employees training in the Silica Dust Standard [records to be maintained]			
	LADDERS AND SCAFOLDING OVER 10 FEET			
121.	Training records for employees kept available for Audit [NYC Requires user certificate]			
122.	Extend 36" above landing			
123.	Secured (tied off)			
124.	Solid rungs			
125.	Proper angle – 1;4 working length of ladder			
126.	Provide at breaks in elevation 19" or more			
127.	Top & midrail toe board			
128.	Supported on solid base			
129.	Cross bracing properly overlap			
130.	Fully planked & properly overlap			
131.	Working are fee of debris			

CAPITAL PROGRAMS
MONTHLY PROJECT SAFETY AUDIT WORKSHEET

		YES	NO	NA
	MANUAL MATERIAL HANDLING			
132.	Mechanical lifts used when practical			
133.	Material stage to minimize lifting and carrying			
134.	Rigging equipment in good condition			
135.				
	DEMOLITION			
136.	Evidence of written engineering survey, Guardrail systems in place where needed			
137.	Debris stored properly – ie floors that can hold the load			
138.	Proper use of mechanical equipment , Competent person inspection as needed			
	BARRICADES AND RAILINGS			
139.	Floor openings protected			
140.	Stairways railings/steps filled			
141.	Open sided floors protected			
	TOOLS, HAND & POWER			
142.	Proper tools for each job - right tool being used for job at hand			
143.	Inspection and maintenance			
144.	Hand tools in good condition			
145.	Tool cords/plugs in good condition (strain relief)			
146.	Proper instruction in use			
147.	Employees are using power tools properly			
148.	Guards in place on machines/equipment			
149.	Guards on machines/equipment in good condition			
150.	When powder-actuated tools are used is proper PPE being worn (eyes, face, ears and hands)			
151.	Power tools protected by GFCI			
152.	Laser operators' proof of qualifications			
153.	Laser warning placards posted			
154.	Operators of powder-actuated tools are authorized			
	HOIST , CRANES, DERRICKS			
155.	Adequate clearances			
156.	Load capacities & proper usage			
157.	Clearances to energized equipment			
158.	Rigging,			
159.	Hand/voice communications: Crane Cab			
	EMERENCY ITEMS			
160.	Emergency evacuation map posted near work area?			
161.	Emergency phone numbers posted and known by all?			
162.	Emergency eyewash and/or shower units accessible?			
163.	First aid kit available at work site			
164.	First aid trained competent person available?			
165.	BBP kit available/BBP trained individual on site?			
166.	Fire extinguishers readily available (not blocked)?			
167.	Fire extinguishers inspected monthly/yearly as needed?			
	MOTOR VEHICLES/EARTH MOVING EQUIPMENT			
168.	Alarm/spotter if obstructed view to the rear			
169.	Seatbelts being worn			
170.	Bi-directional machines have operative horn			

CAPITAL PROGRAMS
MONTHLY PROJECT SAFETY AUDIT WORKSHEET

		YES	NO	NA
	MANUAL MATERIAL HANDLING			
171.	Mechanical lifts used when practical			
172.	Material stage to minimize lifting and carrying			
173.	Rigging equipment in good condition			
	WORK ZONE			
174.	Signs good condition/non-conflicting/clear view/proper position			
175.	Message sign – appropriate message/proper position			
176.	Arrow panel – auto dim/bulbs out/proper position			
177.	TCD's in good condition/proper number and spacing/proper taper length			
178.	Flaggers certified/visible/properly positioned/flagging correctly/advanced warning signs			
179.	Impact attenuator properly positioned/maintained			
180.	Pavement markings – remove/repair/need additional			
181.	Misc-adequate buffer/material and equipment properly stored/ work area protected/ evidence of accidents			
	ENVIRONMENTAL/SAFETY			
182.	Spill Kit(s) availability			
183.	Dewatering activities appropriate and in proper position			
184.	Wetland/waterways checked			
	SITE SECURITY			
185.	Warning signs in - place			
186.	Open ditches/hole protected			
	ADMINISTRATIVE	**YES**	**NO**	**NA**
187.	Drop-offs protected			
188.	Equipment secured			
189.	Utility ditches flagged or barricaded			
	GENERAL INSPECTION			
190.	Posters and safety signs/warnings posted			
191.	Safety meetings held periodically			
192.	First aid kit available and adequately stocked			
193.	Accident reporting procedures established/inplace			
194.	Substance abuse policy in-place			
195.	Injury records being kept			
196.	New employee orientation completed			
	ORDERLINESS AND MATERIAL STORAGE			
197.	General orderliness			
198.	Regular disposal of waste and trash			
199.	Trash containers			
200.	Nails removed or bent down			
201.	Spills cleaned up promptly			
202.	Drinking water available			
203.	Sanitary facilities			
204.	Stability of materials in storage			
205.	Fire lines maintained			
206.	Control of combustibles			
207.	Men lifting properly			
208.	Correct use of material handling equipment			
209.	Dust protection			
	CONFINED SPACE PROCEDURE			

		YES	NO	NA
210.	Confined Space entry training conducted			
211.	Signs posted to identify confined spaces			
212.	Personal protective equipment specified			
213.	Standby person			
214.	Emergency equipment for standby person			
215.	Permit required precautions taken			
216.	All required signatures for entry/testing			
217.	Permits posted prior to start of work			
218.	Permits retained a minimum of two years			
	LEAD REMOVAL/ABESTOS REMOVAL/STEEL ERECTION			
219.	Permit as required – displayed?			
220.	Compliance with approved plan?			
221.	Full face mask/half face mask used all time per approved plan?			
222.	Air sample monitored?			
223.	Portable wash and eye wash station near work area?			
224.	Work area secured from visitor? Lead/Asbestos sign installed?			
225.	Waste drum nearby? Labeled properly?			
226.	Are taglines attached to suspended materials?			
227.	Factor of safety for lifting should be 150% - drawings approved?			
228.	Work area clean at end of shift? (No garbage or debris – trip hazard)			
229.	Debris stored properly and cautioned tape around? Removed in timely manner?			
230.	Is work area secured and safe?			
231.	Emergency door locked at end of shift?			
232.	Gasoline, diesel fuel etc. must not be stored within GCT. The workers are to fuel up their equipment and then remove the cans from the building.			

CAPITAL PROGRAMS
MONTHLY PROJECT SAFETY AUDIT WORKSHEET

	ADMINISTRATIVE	YES	NO	NA
	ELECTRICAL			
233.	Electrical cords being used are proper size of wire			
234.	Extension cords with bare wires taken out of service			
235.	Extension cords with missing ground prongs taken out of service			
236.	Lockout/tagout devices are available/being used			
237.	Circuit breakers/disconnects are properly identified (labeled) and accessible			
238.	Energized panels/devices are covered			
239.	Terminal boxes equipped with required covers			
240.	GFCI Protection provided on temporary power and power tools			
	HI-RAIL EQUIPMENT			
241.	Equipment has been inspected within (3) months & Inspection Sticker on inside of door.			
242.	Operator CDL available			
243.	Hi-rail daily inspection form completed			

Comments:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Subcontractors on site (list name and trade):

_____
_____
_____
_____
_____
_____
_____

Signature(s):_____

SECTION 01 35 29 - HEALTH, SAFETY, AND EMERGENCY RESPONSE PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and other Division 01 Specification Sections, apply to the Work of this Section.

1.2 RELATED SECTIONS

A. Section 01 31 00 - Project Management and Coordination.

B. Section 01 33 00 - Submittal Procedures.

C. Section 01 74 00 - Cleaning and Waste Management.

1.3 SUMMARY

A. This Section specifies requirements for:
   1. Safety procedures.
   2. Safety Supervisor.
   3. Health and Safety Plan (HASP).
   4. Emergency response procedures.

1.4 REFERENCES

A. Abbreviations and Acronyms:
   1. ACM: Asbestos containing material.
   2. LEED®: Leadership in Energy and Environmental Design.
   3. MSDS: Material Safety Data Sheet.
   4. PCBs: Polychlorinated Biphenyls.
   5. RACM: Regulated asbestos containing material.
   6. RCRA: Resource Conservation and Recovery Act.

B. Definitions:
   1. Asbestos: The asbestiform varieties of serpentine (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite, anthophyllite, and actinolite- tremolite.
   2. Asbestos Containing Material (ACM):
      a. Category I Nonfriable Asbestos-Containing Material: Asbestos- containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos as determined using the Polarized Light Microscopy method specified in Appendix E of 40 CFR 63.
      b. Category II Nonfriable Asbestos-Containing Material: Any material, excluding Category I nonfriable asbestos-containing material, containing more than 1 percent

asbestos as determined using the Polarized Light Microscopy method specified in Appendix E of 40 CFR 63, that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

3. Confined Space: A space large enough and configured so an employee can enter and perform assigned work, has limited or restricted means of entry or exit and is not designed for continuous human occupancy, such as pits, wells, excavations or vaults.
4. Contaminated Site: A site at which hazardous, toxic, or pollutant substances occur at concentrations above background levels and where assessment indicates it poses, or is likely to pose, an immediate or long- term hazard to human health or the environment.
5. Friable: Material that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.
6. Friable Asbestos Material: Material containing more than 1 percent asbestos as determined using the Polarized Light Microscopy method specified in Appendix E of 40 CFR 63.
7. Lockout/Tagout: Placing a lock and/or tag on an energy-isolating device to protect employees by either indicating the device separates a machine or piece of equipment that employees are currently working at from the energy source, or preventing the energy source from being energized to the machine or piece of equipment.
8. Polychlorinated Biphenyls (PCBs): Any chemical substance that is limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contains such substance, including, but are not limited to: dielectric fluids; solvents; oils; waste oils; heat transfer fluids; hydraulic fluids; paints or coatings; sludges; slurries; sediments; dredge spoils; soils; materials containing PCBs as a result of spills; and other chemical substances or combinations of substances, including impurities and byproducts and any byproduct, intermediate, or impurity manufactured at any point in a process.
9. Regulated Asbestos Containing Material (RACM): Any of the following categories of asbestos:
    a. Friable asbestos material.
    b. Category I non-friable asbestos containing material (ACM) that has become friable.
    c. Category I non-friable asbestos containing material (ACM) that will be or has been subjected to sanding, grinding, cutting, or abrading.
    d. Category II non-friable asbestos containing material (ACM) that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on it during regulated demolition or renovation operations.

C. Reference Standards:
    1. State of New York:
        a. New York Code, Rules and Regulations (NYCRR):
            1) The New York State Department of Environmental Conservation (NYSDEC):
                a) 6 NYCRR Part 201 General Provisions.
                b) 6 NYCRR Part 203 Indirect Sources Of Air Contamination.
                c) 6 NYCRR Part 231 Implementation Guidance.
        b. New York State Energy Research and Development Authority (NYSERDA):
            1) New York State Executive Order No. 111 – “Green and Clean” State Buildings and Vehicles Guidelines.
        c. Official Compilation of the Rules and Regulations of the State of New York (NYCRR).
            1) 12 NYCRR Part 23 - Protection in Construction, Demolition and Excavation Operations.
            2) 12 NYCRR Part 56 – Asbestos.

3) 16 NYCRR Part 753 - Protection of Underground Facilities.

2. United States Government:
   a. Americans with Disabilities Act. (Pub. L. 101–336, 104 Stat. 327, 42 U.S.C. 12101–12213 and 47 U.S.C. 225 and 611) [ADA].
   b. Department of Justice:
      1) 2010 ADA Standards for Accessible Design,
      2) 28 CFR 35 - Nondiscrimination on the Basis of Disability in State and Local Government Services
      3) 28 CFR 36 – Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities.
   c. Environmental Protection Agency (EPA):
      1) 40 CFR 61 National Emission Standards for Hazardous Air Pollutants.
      2) 40 CFR 63 National Emission Standards for Hazardous Air Pollutants for Source Categories.
      3) 40 CFR 112 Oil Pollution Prevention.
      4) 40 CFR 745 Lead; Renovation, Repair, and Painting Program.
      5) 40 CFR 761 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions.
   d. Occupational Safety and Health Administration (OSHA):
      1) 29 CFR 1903 - Inspections, Citations, and Proposed Penalties.
      2) 29 CFR 1904 - Recording and Reporting Occupational Injuries and Illnesses.
      3) 29 CFR 1910 - Occupational Health and Safety Standards.
      4) 29 CFR 1926 - Safety and Health Regulations for Construction.
   e. United States Code (U.S.C.):
      1) 15 U.S.C. Section 2601 et seq.
         a) Federal Toxic Substances Control Act, Public Law 99-519, as amended.
      2) 42 U.S.C. Section 6901 et seq.
         a) Resource Conservation and Recovery Act (RCRA), Public Law 94-580.
3. United States Green Building Council (USGBC):
   a. LEED 2009 for New Construction and Major Renovations, http://www.usgbc.org.
   b. LEED Reference Guide for Green Building Design and Construction, 2009 Edition.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Facility Services Coordination:
      a. The Contractor and his Subcontractors are responsible for coordination of the Work of this Contract with the appropriate local utilities, whether or not they are listed in the Contract Documents to prevent accidents.

B. Meetings:
   1. Preconstruction Conference:
      a. At the Preconstruction Conference specified in Section 01 31 00, Project Management and Coordination, the laws, codes, traffic regulations, permit requirements, and other public agencies' safety regulations applicable to this Contract will be discussed.
      b. The Contractor's responsibility for making arrangements for safety, first aid, emergency actions, security, and a full-time safety representative will be defined.

c. The Contractor's responsibility for developing and implementing a Safety Program and Safety Plan, Surveillance and Security Control Program, and Site Security Plan will be discussed.
d. Metro-North construction safety and security representatives will be introduced.

2. Progress Meetings:
   a. During the weekly Progress Meetings specified in Section 01 31 00, Project Management and Coordination, ensure that health and safety is an agenda item discussed and documented.

3. Safety Meetings:
   a. The Contractor is responsible for holding and conducting weekly safety meetings and for holding and conducting tool box/lunch box meetings as required.
      1) The Construction Manager may attend and conduct the Safety Meetings.
      2) Document the subject and attendance of the Safety Meetings, and submit a copy to the Construction Manager for a Project Safety File.
      3) Safety Meeting agendas should at a minimum include discussion of accidents and near misses at the Site, safety and work performance, the nature of hazards observed, and upcoming work and potential hazards.
   b. Periodic meetings may be held to evaluate incidents and determine if formal changes to the approved Health and Safety Plan (HASP) specified herein may be required.

1.6 REGULATORY REQUIREMENTS

A. Strictly enforce the safety rules and regulations imposed by the Town Village of Scarsdale, the Town of Greenburgh, Westchester County, the State of New York, the Occupational Safety and Health Administration (OSHA), Metro-North, and others having jurisdiction.
   1. The Metro-North is the final judge of protections necessary for safe operations at its facilities.

B. Occupational Safety and Health Administration (OSHA) Rules and Regulations:
   1. Comply with applicable Occupational Safety and Health Administration (OSHA) rules and regulations as specified in 29 CFR 1904, 29 CFR 1910, and 29 CFR 1926, and with the State of New York, Westchester County, Town of Greenburgh, and Town-Village of Scarsdale, including 12 NYCRR Part 23.
      a. Keep a copy of the OSHA rules and regulations at the Site at all times.
      b. Keep a copy of applicable Material Safety Data Sheets (MSDS) for the materials stored and used at the Site at the Site at all times.
   2. Occupational Safety and Health Administration (OSHA) Compliance Inspection:
      a. If an OSHA area compliance officer arrives at the Site and requests to see the person in charge to get permission to perform an inspection and evaluation of work place conditions, cooperate with and assist the OSHA area compliance officer.

C. Americans with Disabilities Act (ADA):
   1. Provide access to all citizens and employees using designs, specified products, and construction methods meeting or exceeding the Americans with Disabilities Act (ADA) requirements as specified in 2010 ADA Standards for Accessible Design, 28 CFR 35, and 28 CFR 36.
      a. Provide ramps with handrails at field offices.

D. Drug and Alcohol Free Workplace:

1. When illegal drug activity or involvement, or public drunkenness, is discovered in the workplace, notify law enforcement officials.

1.7 CONSTRUCTION HEALTH AND SAFETY REQUIREMENTS

A. Safety Supervisor:
   1. Designate a full-time onsite person to act as Safety Supervisor.
   2. The Safety Supervisor is responsible for supervising the safety of persons on or about the Work, and the property affected thereby.
   3. Once the Safety Supervisor has been designated, do not change the individual without the permission of the Metro-North.

B. Health and Safety Plan (HASP):
   1. Develop a Contract-specific Health and Safety Plan (HASP) that complies with the requirements for accident prevention, safety training and education, reporting, first-aid, fire protection, and housekeeping specified in 29 CFR 1926; and State occupational safety guidelines related to the worker and the public.
   2. The Contract's Health and Safety Plan must at a minimum include or address the following:
      a. The names, titles, and emergency telephone numbers for the Contractor's Project Manager, Safety Representative, and Project Superintendent.
      b. Emergency contact information, including phone numbers and methods of communicating with emergency services and others.
         1) The Metro-North is responsible for providing a construction "hotline" telephone number which will be answered by Metro-North representative during regular working hours, or by an answering service during other times, for the Contractor to use for emergency communications with the Metro-North.
      c. Safety training and education, including new employee orientation and hazard awareness briefing.
      d. Investigating and reporting incidents, including employee and non- employee injuries, accidents, and statistics.
      e. Medical and first-aid resources, including doctors, hospitals, and ambulance services.
      f. Fire protection, including extinguishers, onsite fire crew, and local fire departments.
      g. Security and other emergency services which may become necessary, such as local police departments, Metro-North security, or hazmat services.
      h. Housekeeping, including clean-up, temporary electrical service, and trash removal.
      i. Sanitation, including potable water, toilets, work areas, and wash facilities as needed.
      j. Personal protective equipment (PPE).
      k. Specific safety programs such as fall protection, excavation, steel erection, hazardous waste operations, confined space entry, and similar type programs.
      l. Hazardous materials and contaminated materials handling and disposal.
      m. Emergency procedures:
         1) Methods of communicating.
         2) Site-specific safety rules and procedures for dealing with the types of risk expected to be encountered on the Site.
      n. Routine inspection schedules for verifying compliance with applicable laws and regulations.
      o. Security procedures to prevent theft, vandalism, and other losses at the Site.

3. Submit the Health and Safety Plan to the Construction Manager at the Preconstruction Conference for review and further discussion at the initial Safety Meeting.
    a. Revise the Health and Safety Plan in response to comments generated at the initial Safety Meeting.
4. Do not commence work at the Site until the Health and Safety Plan has been approved.

C. Project Safety File:
1. The Construction Manager will establish and maintain a Project Safety File and perform related recordkeeping.
2. The Project Safety File will include an OSHA Form 300 Log of Work-Related Injuries and Illnesses, safety meeting minutes and attendance logs, accident/incident investigation reports, and any other relevant safety, health, or environmental records.
3. Cooperate with the Construction Manager by providing documents for the Project Safety File as required.

1.8 SAFETY PROCEDURES

A. Posting Emergency Procedure Guidelines:
1. Prior to the initiation of actual construction, post copies of the emergency procedure guidelines at the Site.
    a. Include directions to and from the nearest hospital.
2. In accordance with 29 CFR 1903.2, post the Occupational Safety and Health Administration (OSHA) poster informing employees of the protection and obligations provided for in the OSHA Act at each field office.
3. Post local labor law postings and other necessary local postings at each field office.

B. Personal Protective Equipment (PPE):
1. Require all workers in construction areas on the Site to wear OSHA- approved hard hats, and when appropriate, approved high visibility warning garments, steel toe work shoes, and safety eye-ware as specified in 29 CFR 1926.
2. Provide additional Personal Protective Equipment (PPE) required for specific tasks, such as hearing protection, specialized eye and face protection, respiratory protection, protective clothing, gloves, radiation badges, safety belts, lifelines, or safety nets.

C. First Aid Station:
1. Provide and fully equip a first aid station at the Site, for furnishing first-aid service to anyone who may be injured in the progress of the Work, and have standing arrangements for the transportation and hospital treatment of any employees or others who may be injured or who may become ill.
    a. Maintain an approved first aid kit in each field office.
    b. Provide an exterior sign on the field office indicating the location of each first aid kit.
    c. Maintain a list of qualified first aid providers at the Site.
2. Ensure that first aid supplies and equipment such as eye wash stations, emergency showers, and first aid kits are provide and maintained in good working order, are kept free from obstruction, and available for immediate use.
    a. Check supplies on a monthly basis, and replenish supplies as they are used up.
3. Maintain and post the names, telephone numbers, and addresses of local hospital emergency rooms and emergency services on the jobsite bulletin board or in the field office(s); and include directions to the local hospital emergency rooms.

4. If injuries involve bleeding wounds, use Personal Protective Equipment (PPE) and properly disinfect areas spattered with blood to neutralize bloodborne pathogens.

D. Hot Work:
1. All hot work shall be per the Uniform Code and Metro-North Safety Rules Hot work permits are required to be obtained by the contractor from Metro-North Fire Safety for all hot work prior to operations.

E. Fire Protection and Control:
1. Provide easily accessible fire extinguishers at each field office and throughout the Site.
   a. Identify each fire extinguisher, and maintain it in operating condition.
   b. Whenever an extinguisher is used, tag it with a label having the word "USED", the date it was used, and the date it was recharged.
2. Flammable/Combustible Materials:
   a. Store all flammable/combustible materials in approved containers, and identify their contents using appropriate labels.
   b. Post "NO SMOKING" signs as necessary.
   c. Enforce "NO SMOKING" rules whenever there is fueling, storage, or use of volatile materials.
   d. Ensure that drums containing flammables are grounded and equipped with an automatic shutoff valve.
3. Welding Safety Precautions:
   a. Welding Enclosures:
      1) Perform all welding and flame-cutting operations in protected areas with full consideration to safety and fire hazards.
         a) Properly ventilate the closed spaces while welding or cutting is being done.
      2) Where arc-welding operations might be viewed within harmful range by persons other than the welding operators and inspectors, maintain suitable protection against the rays of the electric arc.
   b. Flammable Materials:
      1) Take proper precautions to avoid risk of fire or explosion, and do not store flammable or explosive materials in the vicinity of welding or cutting operations.
   c. Welding and Cutting:
      1) Only wet cutting of concrete, concrete block, and asphalt will be permitted.
      2) Perform gas and electric cutting, burning, or welding in accordance with the guidelines of the NFPA 51B.
         a) Post spark shields, and keep a fire watch when performing gas and electric burning operations.
         b) Keep a supply of water readily available during these operations.
      3) For cutting, burning, or welding steel that is coated with lead- based paint, employ personnel certified in accordance with 40 CFR 745.

F. Public Safety and Traffic Control:
1. Provide adequate fencing, barricades, warning signs, and lighting so risk to the public is minimized.
2. Inform appropriate law enforcement agencies of possible traffic problems, and obtain their assistance to provide traffic control if needed or required.

G. Overhead Safety:

1. Notify public utilities operating overhead power lines whenever construction operations are within clearance envelopes established by statute.
2. Submit sketches defining the operations of all cranes used in support of construction and, if requested, similar information for other equipment in use and capable of encroachment into overhead areas.
    a. Show planned locations and movements of the equipment on the sketches, calculations demonstrating the adequacy of the capacity of the crane for the loads, the interface between the footprint of the equipment and the movement of the boom and loads relative to the existing structures and surrounding buildings, the support grillages, the protection of existing utilities and facilities, and any other pertinent details required.
3. For all hoisting operations adjacent to train operations, submit the following data prepared and sealed by a Professional Construction Manager licensed in the State of New York:
    a. Plans and sections showing the locations of cranes, both horizontally and vertically, their operating radii, delivery and disposal locations, and the location of adjacent transit structures.
    b. Crane rating sheets showing that the cranes are capable of lifting 125 percent of the actual weight being lifted.
        1) Submit a complete set of crane charts, including crane, counterweight, and boom nomenclature.
    c. A location plan showing all obstructions such as wires, poles, adjacent structures, and similar structures, and that the proposed lifts are clear of these obstructions.
    d. Data sheets listing the types, sizes, and arrangement of slings, shackles, or other connecting equipment.
    e. Include catalogs or information sheets for specialized equipment.
    f. A complete procedure indicating the location and order of lifts, and any repositioning or re-hitching of the crane or cranes.
    g. Temporary support of any components, including details; and intermediate stages.
    h. A time schedule for each of the various stages, and a schedule for the entire lifting procedure.

H. Excavation Safety:
1. It is the responsibility of the Contractor for making excavations for this Contract in a safe manner.
2. Comply with applicable requirements of OSHA and the State of New York statutes, especially NYCRR 16 Part 753 regarding Underground Utilities.
    a. At least 2 to 10 days prior to the start of digging or excavation Work not counting the day of the call prior to the start of digging or excavation Work, contact Dig Safely New York at 1-800-962-7962 or 811 to arrange for underground utility owners to locate and mark their underground utilities.
        1) Notify utilities prior to all excavations.
    b. If unexpected active underground facilities are encountered during the performance of the Work, immediate notify the Construction Manager.
    c. Cooperate fully with the owners of underground and overhead utilities when utility removal or rearrangement operations are in progress to ensure reasonable progress, minimize duplication of operations, and eliminate unnecessary interruption of services.
3. Temporary Supports:
    a. Safeguard and protect excavations until permanent support has been provided so danger to life and limb is avoided.

b. Where necessary to retain excavations, construct temporary retaining walls, sheet-piling and bracing, or other approved methods to support the adjoining earth.

4. Provide suitable protection against bodily injury.

I. Confined Spaces:

1. Do not allow untrained and unqualified workers or others to enter confined spaces.
2. Furnish the necessary safety equipment such as air monitoring equipment, ventilation system, harness, tripod, and similar items for personnel entering confined spaces.

J. Contaminated Site:

1. This Project's existing Site may be contaminated with lead paint and asbestos at various locations.
2. Take appropriate measures to protect workers, the public, and the environment from harm during construction, abatement, and remediation activities involving the contaminated materials.
3. Toxic Substances:
   a. Control toxic substances, hazardous, and contaminated materials, and harmful nuclear and x-ray radiation in a safe manner.
   b. Comply with the Toxic Substance Control Act, P.L. 94-469 (TSCA) (15
   c. U.S.C. §2601, et seq).
      1) Do not use toxic chemical substances, mixtures, equipment, containers, sealants, coatings, or dust-control agents except in accordance with all provisions of the Toxic Substances Control Act (TSCA) as interpreted by the rules and regulations of 40 CFR 761 for polychlorinated biphenyls (PCBs).
      2) Immediately report in writing any toxic chemical substance, mixture, equipment, container, sealant, coating, or dust-control agent found stored within the Contract area, and stop work in the area until arrangements for the removal of the toxic materials have been made, after which the Contractor may continue to work in the area.
4. Hazardous Air Pollution Control:
   a. The United States Environmental Protection Agency (EPA) has delegated implementation and enforcement of the National Emission Standards for Hazardous Air Pollutants (NESHAP) codified in 40 CFR 61 and 40 CFR 63 to the New York State Department of Environmental Conservation (NYSDEC), Department of Air Resources.
   b. Comply with the requirements of NYSDEC Department of Air Resources.

K. Lockout/Tagout Requirements:

1. Only allow authorized employees to apply or remove locks and/or tags.
2. Do not allow one employee to remove a lock and/or tag placed by another employee.
3. Do not use lockout/tagout locks for purpose other than employee safety.

L. Housekeeping:

1. Maintain good housekeeping at the Site at all times.
   a. Provide adequate and proper tool, equipment, materials, and waste storage.
      1) Remove or secure ladders; and barricade, cover, or otherwise identify to the public all excavations.
   b. Furnish sufficient waste containers, and ensure they are emptied each day or as otherwise stipulated in Section 01 74 00, Cleaning and Waste Management.
   c. Furnish and maintain adequate sanitation facilities and lavatories in accordance with the requirements specified in 29 CFR 1926.51 Sanitation.

1.9 EMERGENCY RESPONSE PROCEDURES

A. Establish procedures to deal with emergencies, and submit written guidelines discussing procedures for the following to the Construction Manager for approval:
   1. Fire emergencies.
   2. Injury to employees.
   3. Injury to the general public.
   4. Property damage, including damage to utilities such as gas, water, sewage, electrical facilities, telecommunications, or pedestrian and vehicle routes.
   5. Hazardous/toxic material spills or discharges.
   6. Site evacuation.
   7. Providing emergency access and egress lanes.

B. Spill Prevention, Control, and Countermeasure (SPCC) Plan:
   1. In accordance with the requirements specified in 40 CFR 112, prepare and implement an approved Spill Prevention, Control, and Countermeasure (SPCC) Plan applicable to facilities storing, transferring, distributing, using, and/or consuming oil and oil products and which could discharge harmful quantities of oil into or on navigable waters or their adjoining shorelines near the Site.
      a. The SPCC Plan must detail the equipment, workforce, procedures, and steps to prevent, control, and provide adequate countermeasures to a discharge; and must include the physical layout of the facility and a facility diagram.
      b. The SPCC Plan must describe the type of oil in each fixed, mobile, and portable container and its storage capacity.
      c. The SPCC Plan must detail discharge prevention measures including procedures for routine handling of products such as loading, unloading, and facility transfers.
      d. The SPCC Plan must describe discharge or drainage controls such as secondary containment around containers and other structures, equipment, and procedures for the control of a discharge.
      e. The SPCC Plan must detail countermeasures for discharge discovery, response, and cleanup of both the facility's capability and those that might be required of a Design Builder.
      f. The SPCC Plan must describe the methods of disposal of recovered materials in accordance with applicable legal requirements.
      g. The SPCC Plan must include a contact list and phone numbers for the facility response coordinator, National Response Center, cleanup Design Builders having an agreement for response, and appropriate Federal, State, and local agencies who must be contacted in case of a discharge.
      h. The SPCC Plan must be certified by a registered Professional Construction Manager, and may be required to be submitted to and approved by the Environmental Protection Agency's Regional Administrator.
   2. Submit copies of the Spill Prevention, Control, and Countermeasure (SPCC) Plan to the Construction Manager for information.

C. Fire/Police Rapid Entry System:
   1. Provide temporary fire/police rapid entry system key boxes to facilitate entry to the Site by police and/or fire services until the permanent fire/police rapid entry system is installed, operational, and accessible to fire and police agencies.

D. The Contractor is responsible for moving any equipment or materials expeditiously to provide access for emergency vehicles to adjacent properties at any time at no increase in the Contract Price.

E. Reporting:
1. Accident Reporting:
a. Report all on-the-job injuries to the Metro-North's representative, the Safety Supervisor, and the Construction Manager within 24-hours of the incident; and submit all paperwork pertaining to such injuries as required.
1) Report all accidents, injuries, and illnesses, no matter how slight.
2) Report employee and non-employee injuries, such as injuries to customers, Subcontractors, trespassers, and similar persons, occurring on Metro-North property or arise from Metro-North operations.
3) The Safety Supervisor must ensure that the personal injuries are properly investigated and reported.
a) Each week, submit copies of accident reports for all accidents that week to the Construction Manager for information.
b. Provide immediate medical treatment as needed for job-related injuries or illnesses.
c. Have the affected person or their immediate supervisor complete an accident/incident report.
1) Have the supervisor investigate and complete the accident/incident report within 24 hours of the accident/incident, and submit it to the Construction Manager.
2. Non-Conformance Reporting:
a. If the Construction Manager notices major safety violations, unsafe practices, and/or hazardous conditions during the course of performing normal duties in non-conformance to the Health and Safety Plan, the nearest Contractor's supervisor will be notified that corrective actions must be taken immediately, or their work and payment will be stopped.
1) Reports of such incidents will be placed in the Project Safety File.

F. Hazardous/Toxic Material Spills or Discharges:
1. When a hazardous material spill or leak occurs, determine the details of the incident and immediately notify Safety Supervisor, the Construction Manager, and the Metropolitan Transportation Authority Police (MTA) Police (1-888-682-9117).
a. Provide as much detail as possible concerning the location of the emergency or incident and the nature of the emergency or incident, including the hazardous material involved.
b. Obtain the following information from placards, which are required on vehicles and containers that contain hazardous materials:
1) The condition of containers, whether intact, leaking, burning; and number of the containers involved.
2) If the spill or discharge occurs during delivery, obtain the name of the carrier, the vehicle number, and telephone numbers located on the delivery vehicle.
a) The material carrier is primarily responsible for responding to the emergency, and should be fully trained in handling and responding to emergencies and incidents involving every hazardous material they transport.
c. Cooperate fully with the authorities, including the following:
1) Appropriate carrier authority.
2) Metropolitan Transportation Authority Police.

3) State and local officials and police.
4) Other emergency personnel.

d. Follow the authorities' instructions for evacuating the area, handling the material, giving first aid, and similar actions.

1.10 QUALITY ASSURANCE

A. Qualifications:
1. Safety Supervisor's Qualifications:
a. The Safety Supervisor must have a working knowledge of all U.S. Department of Labor (OSHA) regulations, specialized training and substantial experience in construction safety supervision, and have the ability to develop and conduct safety-training courses.
b. The Safety Supervisor must be familiar with industrial hygiene equipment and testing as required for the protection of all employees.
c. Submit the name and qualifications of the Safety Supervisor to the Construction Manager for approval.
1) The Safety Supervisor must be acceptable to the Construction Manager and Metro-North, and his performance will be reviewed on a continuing basis.
2) The Metro-North reserves the right to revoke the approval of the Safety Supervisor and require a replacement.

B. Sustainability Standards Certifications:
1. In accordance with New York State Executive Order No. 111, the Project must achieve LEED certification as described in LEED 2009 for New Construction and Major Renovations and the LEED Reference Guide for Green Building Design and Construction, 2009 Edition.
a. Comply with the requirements specified in PDC Appendix I, CPG-F8 Sustainable Infrastructure Design, to earn the points for this LEED credit as part of housekeeping activities and obtain approval for the Project to claim this credit.

1.11 SUBMITTALS

A. Action Submittals:
1. Submit the following to the Construction Manager for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
a. Special Procedure Submittals:
1) Weekly accident reports.
b. Qualification Statements:
1) Safety Supervisor's Qualifications.

B. Informational Submittals:
1. Submit the following to the Construction Manager for information in accordance with the requirements of Section 01 33 00, Submittal Procedures:
a. Special Procedure Submittals:
1) Spill Prevention, Control, and Countermeasure (SPCC) Plan.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Occupational Safety and Health Administration (OSHA) safety and construction regulations related to the transportation, delivery, and unloading of materials as specified in 29 CFR 1910 and 29 CFR 1926, paying special attention to those related to occupational health and environmental control; hazardous materials; personal protective equipment; materials handling and storage; toxic and hazardous substances; illumination; ventilation; hazard communication; cranes, derricks, hoists, elevators, and conveyors; and retention of DOT markings, placards, and labels.

B. Packaging Waste Management:
   1. Comply with the approved Waste Management Plan required in Section 01 74 00, Cleaning and Waste Management.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 41 00 - REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and other Division 01 Specification Sections, apply to the Work of this Section.

1.2 RELATED SECTIONS

A. Section 01 31 00 - Project Management and Coordination.

B. Section 01 33 00 - Submittal Procedures.

1.3 SUMMARY

A. This Section specifies regulatory requirements for:
1. Construction Management Meeting.
2. Storm Water Pollution Prevention Plan (SWPPP).
3. Construction Management Plan.
4. Temporary Construction Permit.
5. Village of Scarsdale Building Permit.
6. Village of Scarsdale Tree Cutting Permit.s
7. Town of Greenburgh Building Permit.
8. Electrical Permit and Certificate of Inspection.
9. Erosion Control Plan.
10. Demolition Permit.
11. Flammable and Combustible Liquids Permits.
12. Encroachment approvals.
13. Sprayed Insulation Permit.
14. Certificate of Use and Occupancy.
15. Air Pollution Control Ordinance permits and certificates.
16. Licensed tradesmen.
17. Excavation and grading bonds.

B. State of New York permits, inspections, and approvals.
1. Storm Water Management Program.
2. Hazardous air pollution control.
3. Lead abatement.
4. “Green and Clean” State buildings.

C. United States Government permits, inspections, and approvals.
1. Periodic OSHA compliance inspections.
2. Controlling toxic substances and hazardouss materials.

D. Obtaining legal agreements for patented devices, materials, and processes.

1.4 REFERENCES

A. Abbreviations and Acronyms:
1. ACM: Asbestos containing material.
2. ADA: Americans with Disabilities Act.
3. ADAAG: Americans with Disabilities Act Accessibility Guidelines.
4. AHERA: Asbestos Hazard Emergency Response Act.
5. ACM: Asbestos containing material.
6. BMPs: Best management practices.
7. CFR: Code of Federal Regulations.
8. EPA: Environmental Protection Agency.
9. IBC: ICC International Building Code
10. ICC: International Code Council.
11. NESHAPs: National Emission Standards for Hazardous Air Pollutants.
12. NPDES: National Pollutant Discharge Elimination System.
13. OSHA: Occupational Safety and Health Administration.
14. PACM: Presumed asbestos containing material.
15. PCBs: Polychlorinated Biphenyls.
16. RACM: Regulated asbestos containing material.
17. RCRA: Resource Conservation and Recovery Act.
18. ROW: Right-of Way.
19. SWPPP: Storm Water Pollution Prevention Plan.
20. U.S.C.: United States Code.
21. VOC: Volatile organic compounds.

B. Definitions:
1. Asbestos: The asbestiform varieties of serpentine (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite, anthophyllite, and actinolite- tremolite.
2. Asbestos Containing Material (ACM):
   a. Category I Nonfriable Asbestos-Containing Material: Asbestos- containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos as determined using the Polarized Light Microscopy method specified in Appendix E of 40 CFR 63.
   b. Category II Nonfriable Asbestos-Containing Material: Any material, excluding Category I nonfriable asbestos-containing material, containing more than 1 percent asbestos as determined using the Polarized Light Microscopy method specified in Appendix E of 40 CFR 63, that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.
3. Authority Having Jurisdiction (AHJ): Building Code officials, zoning officials, inspectors, and government and regulatory agencies given the authority to protect the public's health, safety, and welfare.
4. Friable: Material that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.
5. Friable Asbestos Material: Material containing more than 1 percent asbestos as determined using the Polarized Light Microscopy method specified in Appendix E of 40 CFR 63.
6. Polychlorinated Biphenyls (PCBs): Any chemical substance that is limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contains such substance, including, but are not limited to: dielectric fluids; solvents;

oils; waste oils; heat transfer fluids; hydraulic fluids; paints or coatings; sludges; slurries; sediments; dredge spoils; soils; materials containing PCBs as a result of spills; and other chemical substances or combinations of substances, including impurities and byproducts and any byproduct, intermediate, or impurity manufactured at any point in a process.

7. Regulated Asbestos Containing Material (RACM): Any of the following categories of asbestos:
   a. Friable asbestos material.
   b. Category I nonfriable asbestos containing material (ACM) that has become friable.
   c. Category I nonfriable asbestos containing material (ACM) that will be or has been subjected to sanding, grinding, cutting, or abrading.
   d. Category II nonfriable asbestos containing material (ACM) that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on it during regulated demolition or renovation operations.
8. Right-of Way: Land expressly reserved for vehicle/pedestrian traffic or utilities.
9. Volatile Organic Compounds (VOC): Generally meant to refer to organic chemical compounds that have high enough vapor pressures under normal conditions to significantly vaporize and enter the atmosphere.
   a. The U.S. Environmental Protection Agency has composed the following definition for regulatory, not necessarily scientific, purposes: “VOC means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions (and then lists several other exemptions).”

C. Reference Standards:
   1. Illuminating Engineering Society of North America’s (IES):
      a. The Lighting Handbook.
   2. State of New York:
      a. New York State Department of Environmental Conservation (NYSDEC):
         i. Regulations. http://www.dec.ny.gov/regulations/regulations.html
      b. State Pollution Discharge Elimination System (SPDES):
         i. Permit No. GP-0-10-001 - SPDES General Permit for Stormwater Discharges from Construction Activity.
         ii. Permit No. GP-0-10-002 - SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s).
      c. New York State Department of State:
         i. Division of Code Enforcement and Administration, http://publicecodes.cyberregs.com/st/ny/st/index.htm:
            I. Building Code of New York State.
            II. Residential Code of New York State.
            III. Existing Building Code of New York State.
            IV. Fire Code of New York State.
            V. Mechanical Code of New York State.
            VI. Energy Conservation Construction Code of New York State.
            VII. Property Maintenance Code of New York State.
            II. New York State Department of Transportation (NYSDOT):
      d. NYSDOT Standard Specifications (U.S. Customary Units). https://www.dot.ny.gov/main/business- center/engineering/specifications.
      e. New York State Standard Sheets (U.S. Customary Units). https://www.dot.ny.gov/main/business-center/engineering/cadd-info/drawings/standard-sheets-us.

f. New York State Supplement to the Manual on Uniform Traffic Control Devices for Streets and Highways (2009 Edition). https://www.dot.ny.gov/divisions/operating/oom/transportation- systems/traffic-operations-section/mutcd.

g. New York State Energy Research and Development Authority (NYSERDA):
   i. New York State Executive Order No. 111 – "Green and Clean" State Buildings and Vehicles Guidelines.

h. Official Compilation of the Rules and Regulations of the State of New York (NYCRR).

i. The New York State Department of Environmental Conservation (NYSDEC):
   I. 6 NYCRR Part 201 General Provisions.
   II. 6 NYCRR Part 203 Indirect Sources Of Air Contamination.
   III. 6 NYCRR Part 231 Implementation Guidance.

j. The New York State Department of Health (NYSDOH):
   I. 10 NYCRR Part 67 - NYS Regulations for Lead Poisoning Prevention and Control.

k. The New York State Department of Labor (NYSDOL):
   I. 12 NYCRR Part 23 - Protection in Construction, Demolition and Excavation Operations.
   II. 12 NYCRR Part 56 – Asbestos.

l. The New York State Department of Public Service (NYSDPS):
   I. 16 NYCRR Part 753 - Protection of Underground Facilities.

3. United States Government:

a. Department of Justice:
   i. 2010 ADA Standards for Accessible Design,
   ii. 28 CFR 35 - Nondiscrimination on the Basis of Disability in State and Local Government Services
   iii. 28 CFR 36 – Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities.
   II. Environmental Protection Agency (EPA):
   i. 40 CFR 123 and 124 - National Pollutant Discharge Elimination System Permit Application Regulations for Storm Water Discharges; Final Rule.
   ii. 40 CFR 9, 122, 123, and 124 - National Pollutant Discharge Elimination System—Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges; Final Rule
   iii. 40 CFR 61 National Emission Standards for Hazardous Air Pollutants.
   iv. 40 CFR 763 Asbestos-Containing Materials in Schools; Final Rule and Notice.

b. Federal Highway Administration (FHWA):
   i. Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) with New York State Supplement.

c. Federal Transit Administration (FTA):
   i. 49 CFR 661 Buy America Requirements.

d. Occupational Safety and Health Administration (OSHA):
   i. 29 CFR 1910 Occupational Health and Safety Standards.
   ii. 29 CFR 1926 Safety and Health Regulations for Construction.

e. United States Code:
   i. 15 U.S.C. Section 2601 et seq.
      I. Federal Toxic Substances Control Act [P.L. 94-469, P.L. 99- 519, as amended].
      II. Asbestos Hazard Emergency Response Act (AHERA).

ii. 33 U.S.C. Section 1251 et seq.
    I. Water Quality Act of 1987 [P.L. 100-4].
    II. Clean Water Act of 1977 [P.L. 95-217].
    III. Federal Water Pollution Control Act Amendments of 1972 [P.L. 95-500].
iii. 42 U.S.C. Section 2000e et seq.
iv. 42 U.S.C. Section 6901 et seq.
v. Resource Conservation and Recovery Act (RCRA) [P.L. 94- 580].
    I. 42 U.S.C. Section 7401 et seq.
vi. Air Pollution Prevention and Control.
    I. Clean Air Act [P.L. 95–95], as amended.
vii. 42 U.S.C. Sections 12101–12213.
viii. Equal Employment Opportunity:
    I. Civil Rights Act of 1964 [P.L. 88-352 (Title VII - Equal Employment Opportunity)], as amended.
ix. Equal Opportunity for Individuals with Disabilities.
    I. Americans with Disabilities Act of 1990 (ADA) [P.L. 101-336].
    II. ADA Amendments Act of 2008 [P.L. 110–325].
    III. 47 U.S.C. Section 225.
    IV. Telecommunications Services for Hearing Impaired and Speech-impaired Individuals.
    III. ADA Amendments Act of 2008 [P.L. 110–325, P.L. 104– 104, Pub. L. 111–260]
    IV. 47 U.S.C. Section 611.
    V. Closed-captioning of Public Service Announcements.
    VI. Americans with Disabilities Act (ADA) [P.L. 98-549, P.L. 101–336].
    VII. 49 U.S.C. Section 5323(j).
    VIII. Buy America Act [P.L. 103–429].
    IX. 49 U.S.C. Section 5333(b).
    X. Federal Transit Act

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preconstruction Conference:
1. At the Preconstruction Conference specified in Section 01 31 00 Project Management and Coordination, regulatory requirements will be discussed, including but not limited to:
    a. Equal Employment Opportunity (EEO) and affirmative action requirements.
    b. Requirements of labor provisions stipulated by the U.S. Department of Transportation (DOT) as required.
    c. Laws, codes, traffic regulations, permit requirements, and other public agencies' regulations.
        i. Buy America Act requirements.
        ii. New York State Executive Order No. 111.
        iii. Other laws, codes, regulations, and requirements.

1.6 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

1. Obtain, pay for, and comply with all necessary local, State, and Federal permits, licenses, and inspections.
2. Metro-North:
    a. Certificate of Use and Occupancy:
        i. New buildings in the properties of Metro-North may not be used or occupied in whole or in part until a Certificate of Use and Occupancy has been issued by Metro-North.
            I. This certificate will certify legal use and occupancy and the purpose(s) for which the building or structure may be used.
            II. The Certificate of Use and Occupancy will specify the use group, the fire grading, the maximum live load on all floors, the occupancy load in the building and all parts thereof, and any special stipulations and conditions of the building permit.
3. State of New York Permits, Inspections, and Approvals:
    a. The United States Environmental Protection Agency has delegated authority to the New York State Department of Environmental Conservation (NYSDEC) to issue permits for many sources subject to New Source Performance Standards (NSPS) or National Emission Standards for Hazardous Air Pollutants (NESHAPS) in accordance with Part 201 of the NYSDEC Regulations.
    b. Hazardous Air Pollution Control:
        i. The United states Environmental Protection Agency (EPA) has delegated implementation and enforcement of the National Emission Standards for Hazardous Air Pollutants (NESHAPs) codified in 40 CFR 61 and 40 CFR 63 to the New York State Department of Environmental Conservation (NYSDEC).
        ii. Asbestos Abatement:
            I. For work involving the removal, encapsulation, enclosure, repair, or disturbance of friable or non-friable asbestos, or handling of asbestos material that may result in the release of asbestos fibers, comply with the requirements of 12 NYCRR Part 56.
4. Comply with the OSHA asbestos regulations that protect private sector workers, and public employees in States with OSHA-approved State plans.
    a. At least 10 calendar days prior to commencement of regulated asbestos abatement operations to prepare work areas and construct enclosures, notify the Asbestos Control Bureau and occupants in writing or using the online form, unless waived in writing by the Commissioner or his or her duly authorized representative.
    b. Pay applicable fees.
    c. Only asbestos Design Builders licensed for the particular task can legally perform the work.
    d. If the station building or structure to be demolished or renovated has not been inspected during the past year by an building inspector certified in accordance with the requirements specified in the Asbestos Hazard Emergency Response Act (AHERA) Model Accreditation Plan (MAP), have a currently AHERA-certified building inspector inspect the building or structure to be demolished or renovated and prepare a Phase I asbestos survey.
    e. In either case, obtain a copy of the inspection survey report to determine if asbestos is present; and, if so, to determine the amount of friable asbestos containing material (ACM) present.
    f. Submit a copy of the Asbestos Inspection Report prepared by the currently AHERA-certified building inspector to the Engineer for information.

g. If the asbestos survey determines the building/structure that is to be demolished, renovated, remodeled, or have repair work contains ACM, presumed asbestos containing material (PACM), suspect miscellaneous ACM assumed to be ACM, or asbestos material impacted by the work, have a licensed asbestos abatement Design Builder remove the asbestos.

h. Remove regulated asbestos containing material (RACM) before demolition or renovation activity begins that would break up, dislodge, or similarly disturb the material or preclude access to the material for subsequent removal.

i. RACM does not need to be removed before demolition if:
   i. It is Category I nonfriable ACM that is not in poor condition and is not friable.
   ii. It is on a facility component that is encased in concrete or other similarly hard material and is adequately wet whenever exposed during demolition.
   iii. It was not accessible for testing and was, therefore, not discovered until after demolition began and, as a result of the demolition, the material cannot be safely removed. If not removed for safety reasons, the exposed RACM and any asbestos-contaminated debris must be treated as asbestos-containing waste material and adequately wet at all times until disposed of.
   iv. They are Category II non-friable ACM and the probability is low that the materials will become crumbled, pulverized, or reduced to powder during demolition.

j. When a component that contains, is covered with, or is coated with RACM, is being removed as a unit or in sections:
   i. Adequately wet the RACM exposed during cutting or disjoining operations; and
   ii. Carefully lower each unit or section to the floor and to ground level, not dropping, throwing, sliding, or otherwise damaging or disturbing the RACM.

k. When RACM is stripped from a facility component while it remains in place in the facility, adequately wet the RACM during the stripping operation unless the following conditions exist:
   i. The owner or operator has obtained prior written approval from the Administrator based on a written application that wetting would unavoidably damage equipment or present a safety hazard; and
   ii. The owner or operator uses a local exhaust ventilation and collection system designed and operated to capture and remove the particulate asbestos material produced by the stripping, and it exhibits no visible emissions to the outside air.

5. Lead Abatement:
   a. For work involving the assessment and abatement of conditions conducive to lead poisoning, or handling of lead material, comply with the requirements of 10 NYCRR Part 67.
   b. Have an approved laboratory examine paint and any other environmental samples according to generally accepted scientific methods specified by the Commissioner and report the results of the lead analyses to the designated representative in whose jurisdiction the samples were collected, and submit a copy to the Engineer for information.
   c. Do not commence lead paint abatement in any designated area of high risk prior to issuance of a written notice and demand for discontinuance of conditions conducive to lead poisoning.
   d. Risk reduction efforts may proceed prior to receipt of a notice and demand.
   e. Upon receipt of a notice and demand for discontinuance of conditions conducive to lead poisoning, such conditions must be abated.

i. The extent of abatement and method(s) used will be determined by the Commissioner or his designated representative, in accordance with applicable laws or rules and regulations.

f. United States Government Permits, Inspections, and Approvals:
   i. Perform the Work of this Contract to at all times be in compliance with OSHA regulations in order to pass OSHA inspections which may be performed.

g. Qualifications:
   i. Licensed Tradesmen:
      I. Certain work may only be performed by licensed tradesmen who hold a valid County of Westchester license.
   i. Plumbing:
      I. A Master Plumber licensed by the Westchester County Board of Plumbing Examiners and registered with the Commissioner is required for any work requiring water piping, waste, vent and drain systems, and gas piping and gas appliance installations.
      II. An automatic sprinkler system may be installed without a plumbing permit and by other than a licensed Master Plumber.
   ii. Electrical:
      I. A licensed Master Electrician is required for any work involving electrical wiring, fixtures and appliances (more than 50 volts).

1.7 SUBMITTALS

A. Informational Submittals:
   1. Submit the following to the Engineer for information in accordance with the requirements of Section 01 33 00, Submittal Procedures:
      a. Test and Evaluation Reports:
         i. Paint and any other environmental samples test report.
      b. Special Procedure Submittals as required:
         i. Storm Water Pollution Prevention Plan (SWPPP).
         ii. Construction Management Plan.
            I. Parking Plan.
            II. Fugitive Dust Plan.
         iii. Approved Temporary Construction Permit plans and specifications.
         iv. Building Permit.
         v. Electrical Permit.
         vi. Mechanical Permit.
         vii. Fire Suppression Permit.
         viii. Approved Erosion Control Plan.
         ix. Demolition Permit.
         x. Flammable and Combustible Liquids Permit.
         xi. Encroachment approvals.
         xii. Sprayed Insulation Permit.
         xiii. Asbestos Inspection Report.
         xiv. Copies of excavation and grading bonds.
         xv. Certificate of Inspection of Heating Equipment.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements:
   1. Hazardous Materials:
      a. Do not handle or store hazardous materials without notifying the Fire and Police Departments.
   2. Readily Combustible Materials:
      a. Do not store combustible materials closer than 2 feet to electric motors.
      b. Do not pile or store combustible material against smoke pipes, flues furnaces, steam pipes, or similar hot items.
      c. Store oily waste, rags, or greasy material in metal cans with metal covers.
      d. Store painters' drop cloths, linseed oil, turpentine, thinners, open cans of paint, paint brushes soaking in any flammable liquid, and similar combustible coating materials in an approved paint locker or approved storage room.
      e. Do not fill, store, or transport Class I or II flammable liquids in glass bottles, jugs, or containers.

B. Packaging Waste Management:
   1. Readily Combustible Materials:
      a. At the close of each day, bale and stack shavings, excelsior, rubbish, sacks, bags, litter, hay, straw, and combustible waste materials; and remove them from the building, or orderly store them in suitable vaults, or in metal or metal-lined, covered, receptacles or bins in accordance with the requirements below:
         i. Within buildings, do not store readily combustible materials within 2 feet of the ceiling, sprinkler head, or girder, whichever may be lowest; or where exit from the building could be endangered.
         ii. In the open, do not store readily combustible materials more than 20 feet high, or less than 50 feet from the nearest building.

1.9 WARRANTY/BONDS

A. Bonds:
   1. Excavation and Grading Bonds.
      a. Before a local Building Permit will be issued for excavation, other than for construction of walls, buildings, and parts of buildings; or before a Building Permit will be issued for the removal of any topsoil, sand, gravel, rock, earth, or other substance; the Contractor must obtain a performance and indemnity bond for the Permit issued by a surety company or surety, executed, and filed with the Clerk of the various municipality holding jurisdiction over that individual station as required in a sum required; approved by all required stakeholders.
      b. Submit copies of the excavation and grading bonds to the Engineer for information.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. Regulatory Requirements:
   1. Metro-North:

a. Explosives and Blasting:
    i. Explosives and blasting are not allowed by Metro-North in the performance of the Work of this Project.
2. Town of Greenburgh – Regulatory / Municipal Regulatory Requirements
3. Village of Scarsdale Regulatory / Municipal Regulatory Requirements

4. State of New York:
    a. Comply with the applicable Codes, regulations, and ordinances of the State of New York, including but not limited to:
        i. Department of State's Codes.
        ii. New York State Department of Transportation (NYSDOT) Standard Specifications, Standard Sheets, and Supplement to the Manual on Uniform Traffic Control Devices for Streets and Highways.
        iii. Applicable Rules and Regulations of the State of New York (NYCRR).
5. United States Government:
    a. Buy America Act:
        i. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.
    b. Equal Employment Opportunity (EEO) and Affirmative Action Requirements.
        i. In compliance with the Civil Rights Act of 1964, do not engage in workplace employment discrimination on the basis of race, color, religion, sex, national origin, status as a qualified individual with a disability, or protected veteran.
    c. Toxic Substances:
        i. Control toxic substances, hazardous materials, and harmful nuclear and x-ray radiation at the Site.
        ii. Comply with the Toxic Substance Control Act (TSCA).
            I. Do not use toxic chemical substances, mixtures, equipment, containers, sealants, coatings, or dust-control agents except in accordance with the provisions of the Toxic Substances Control Act (TSCA) as interpreted by the rules and regulations of 40 CFR 761 for polychlorinated biphenyls (PCBs).
            II. Immediately report in writing any toxic chemical substance, mixture, equipment, container, sealant, coating, or dust- control agent found stored within the Project area and stop work in the area until arrangements for the removal of the toxic materials have been made, after which the Contractor may continue to work in the area.
6. Patented Devices, Materials, and Processes:
    a. If designs, devices, materials, or processes covered by patents or copyrights are employed to perform the Work, provide for their use by arranging suitable legal agreements with the patentee or owner of the items.
    b. Defend and hold harmless the Metro-North, and any affected third party from any and all claims for infringement by reason of the use of any such patented designs, devices, materials, or processes, or any trademark or copyright; and indemnify Metro-North (MNR) for any costs, expenses, and damages which it may be obliged to pay by reason of any infringement at any time during the prosecution or after completion of the Work.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:
   1. In accordance with the various municipality Construction Code requirements for each station, protect existing and adjacent public and private property from damage incidental to construction operations.

B. Demolition / Removal:
   1. Service Connections:
      a. In accordance with the various municipality Building Code requirements for each station, before demolishing or removing a building notify all utilities having service connections within the building, such as water, electric, gas, sewer and other connections.
      b. The Demolition Permit to demolish or remove a building will not be issued until a release is obtained from the utilities, stating that their respective service connections and appurtenant equipment, such as meters and regulators, have been removed or sealed and plugged in a safe manner.

3.2 ERECTION, INSTALLATION, AND APPLICATION

A. Comply with all local, State, and Federal laws, codes, rules, and regulations applicable during construction activities.
   1. Comply with the applicable OSHA workplace regulations and requirements.
   2. Excavation:
      a. Comply with applicable requirements of OSHA; the State of New York statutes, especially 12 NYCRR Part 23 regarding excavation and NYCRR 16 Part 753 regarding underground utilities.
   3. Illumination:
      a. Provide and maintain exterior lighting furnishing adequate illumination of driveways and lanes.
         i. Minimize glare and light spillage onto adjacent properties.
         ii. Provide illumination foot candle levels prescribed by the Illuminating Engineering Society of North America’s (IES) The Lighting Handbook for the particular application.
         iii. Illumination is not required for parking areas fenced and barricaded and not used between sunset and sunrise.
   4. Snow Removal:
      a. Clean snow, ice, dirt, debris, and other foreign matter from sidewalks at areas abutting the work areas and in front of or abutting or adjoining any public street, alley, park, or place within the city; and keep them free from these materials.
         i. If the snowfall ceases or the foreign matter ceases to be deposited in the daytime, and the abutting or adjoining lot or premises is a place of business, or is within a "B," "BR," "CB," "UR," "OR," "CO" or "LI" District of the zoning ordinance, complete the removal within the 2 hours after the fall or deposit

ii. If the snowfall ceases or the foreign matter ceases to be deposited in the daytime, and the abutting or adjoining lot or premises is within any other district of the zoning ordinance, complete the removal within 10 hours.
iii. If the snowfall ceases or the foreign matter ceases to be deposited in the nighttime, and the abutting or adjoining lot or premises is a place of business, or is within a "B," "BR," "CB," "UR," "OR," "CO" or "LI" District of the zoning ordinance, complete the removal before 10:00 the next morning,
iv. If the snowfall ceases or the foreign matter ceases to be deposited in the nighttime, and the abutting or adjoining lot or premises is within any other district of the zoning ordinance, complete the removal before 12:00 noon.

b. If the snow and ice on the sidewalk is frozen so hard that it cannot be removed without injury to the sidewalk, distribute ashes, sand, or some other approved abrasive material onto the sidewalk, and as soon as the weather permits, thoroughly clean the sidewalk.

c. Only place the fallen snow that has been removed from the sidewalk area in the gutter.

3.3 SITE QUALITY CONTROL

A. Site Inspections:
1. Periodic Inspection:
a. In accordance with the various municipality Building Codes, a building official may periodically inspect existing work areas for compliance with the law with respect to posting.
i. Alternatively, an inspection report from an authorized licensed professional engineer or architect may be accepted if the inspection and report specifies violations of the requirements of the Code with respect to the posting of floor load, fire grading, occupancy load, and use group of the building.
b. Periodic OSHA compliance inspections may be performed.
i. If an OSHA area compliance officer arrives at the Site and requests to see the person in charge to get permission to perform an inspection and evaluation of work place conditions, cooperate with and assist the OSHA area compliance officer.
2. Mandatory Inspections:
a. In accordance with the various municipality Building Codes, a building official will perform the following minimum quantity of inspections:
i. Foundation Inspection: Made after footing trenches are excavated and the necessary forms erected.
ii. Mechanical, Plumbing, Fire Protection, and Electrical Inspection: Made after all pipes, ducts, and wiring are in place.
iii. Frame and Masonry Inspection: Made after all framing, masonry walls, electrical, mechanical, firestopping, and bracing is in place.
iv. Final Inspection: Upon completion of the building, structure, or facility, but before issuance of the Certificate of Use and Occupancy, a final inspection will be made.

B. Non-Conforming Work:
1. Stop-Work Order:
a. Upon notice by Stop-Work Order from Metro-North or any various municipality managers that work on any station that is being prosecuted contrary to the provisions

of various Building Code, or in an unsafe and dangerous manner, immediately stop work.

b. The stop-work order will be in writing and will be given to the owner of the property involved, or to the owner's agent, or to the person doing the work; and will state the conditions under which work may be resumed.

END OF SECTION

Section 01 43 00
METRO-NORTH QUALITY MANAGEMENT SYSTEM REQUIREMENTS FOR CONTRACTORS

CONTENTS

Section 01 43 00
METRO-NORTH QUALITY MANAGEMENT SYSTEM REQUIREMENTS FOR CONTRACTORS

PART A. GENERAL

A.1. DESCRIPTION AND SCOPE

A. The Contractor, its subcontractors, and suppliers of critical equipment and systems shall be able to demonstrate, at any time during the procurement period, that their responsibilities under this contract are accomplished through an effective and verifiable quality management system and systematic quality control at all locations of production or processing of items covered under this contract.

B. The Contractor shall ensure, through its own procurement requirements, that suppliers and subcontractors implement applicable elements of its quality management system commensurate with the significance and complexity of the services each provides.

C. The Contractor shall:

1. Generate verifiable evidence of compliance or conformance with approved requirements
2. Conduct internal assessments and management review to determine if the quality system is adequately implemented and effective, and
3. Provide clear direction to its own organization, suppliers, and sub-contractors to implement these Quality Management System Requirements and provide systematic and verifiable corrective action and preventive measures when patterns of nonconformity or product unsuited for the purpose intended are identified. Within the Contract period, such direction and status of implementation shall be reported to The Railroad periodically, until corrective/preventive action plans result in the acceptable level of quality.

D. Results of work may be deemed unacceptable if carried out prior to Railroad approval of submittals relevant to satisfying contract technical requirements and these Quality Management System Requirements.

E. These requirements are complimentary, not alternative, to the requirements specified in the contract. Any conflict should be brought to the attention of the Engineer.

F. References:

1. American National Standards Institute (ANSI)/American Society for Quality (ASQ[1]) Standard Q9001-2008 *Quality Management Systems* –

[1] ASQ - American Society for Quality, 600 North Plankinton Avenue Milwaukee, WI 53203 USA or P.O. Box 3005 Milwaukee, WI 53201-3005 USA North America Tel.: 800.248.1946 (http://www.asq.org/).

Requirements

2. Building Code of New York State, sections 1701 – 1704, *Structural Tests & Special Inspections*

3. NY State Dept. of State, Div. of Code Enforcement and Administration, Technical Bulletin January 1, 2003, 19 NYCRR 1221 - Building Code of New York State (BCNYS), Sections 1701-1704, *Structural Tests & Special Inspections*

4. ASTM-E329-11c, *Standard Specification for Agencies Engaged in Construction Inspection, Resting, or Special Inspection*, published Jan.-20122

5. The Metro-North Code Compliance Manual[3]

6. Institute of Electrical and Electronics Engineers (IEEE) 1558-2004, *Standard for Software Documentation for Rail Equipment and Systems*

A.2. DEFINITIONS

For the purposes of this Quality Management System Requirements, the definitions given in the American National Standards Institute, ANSI/ISO/ASQ Q9001-2008 (or newer versions) *Quality Management Systems– Requirements* (henceforth called ISO-9001), and the following definitions apply:

1. The terms "Quality Assurance Program", "Quality Management System" (QMS), and "Quality System" are interchangeable.

2. **The Quality Management System manual** (Quality Manual) is the document that establishes a Contractor's company commitment to quality, objectives for quality, a description of the system, identifies stakeholder organizations and their responsibilities within the system, and policies for the systematic attainment of its quality objectives, including the use of documented requirements for accomplishing work.

3. **Contract Quality Plan** is the document that describes the processes and arrangements established to assure that products delivered and services rendered meet contract criteria and standards. This document addresses contract- or customer-specific clarifications or processes different from the Contractor's company quality system that are necessary to meet contract terms and requirements.

4. **Quality Management System implementing procedures** (or simply

[2] ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States

[3] Latest copy may be obtained from the Metro-North Code Compliance Group, Construction Management Department, and Capital Programs Div.

"procedures") are specific instructions for carrying out policies, processes, and arrangements established in the Quality Manual and Contract Quality Plan.

5. **Acceptance criteria** are the agreed-upon standards against which select observable characteristics in a product or process are compared to determine acceptance of results. Examples are:

   - Construction contract Drawings and Specifications,
   - Construction contractor's shop drawings, samples, work instructions and procedures, and inspection and test results,
   - Regulatory, industry, and generally-accepted professional standards,
   - the Contractor's own internal standards, and
   - Other acceptance criteria agreed to with the Railroad.

6. BCNYS; *Building Code of New York State*

7. CEO, Code Enforcement Office; the Metro-North Code Compliance Group

8. RDP, a New York State Registered or Licensed Design Professional

9. CS&I Consultant, the Railroad's Construction Supervision & Inspection Consultant

10. SI Consultant, the agency providing the services of the SI Inspector; for the purpose of this specification, the CS&I Consultant is also the SI Consultant.

11. SI Inspector, Building Code Special Inspections compliance inspector(s)

12. Designer-of-Record, the Railroad's Registered Design Professional responsible for the Contract Technical Provisions

13. SI, Special Inspection(s), verification activity required by the BCNYS Section 1702 of the materials, installation, fabrication, erection and placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards.

14. **For software and Software Quality Assurance, t**he definitions in IEEE 1558-2004, *Standard for Software Documentation for Rail Equipment and Systems* (henceforth called IEEE 1558) and its other referenced standards shall apply.

A.3. SUBMITTAL

A. **Pre-Award**:

The Contractor shall submit the following with its proposal or as directed by the Railroad's contracting office, if specific direction is provided:

1. The Contractor's Quality Manual.

2. If available, the independent ISO registrar's certification that the quality system, as implemented, conforms to the requirements of ISO-9001.

B. **Post-Award**:

Submit the following to The Railroad:

1. 30 days after contract award
   - Contract Quality Plan approved within the Contractor's project team
   - Contract Software Configuration Management Plan approved within the Contractor's project team (if systems to be installed contain software that may require field updates or with settings and adjustments that apply only to Metro-North)
   - Contract Inspection And Test Plan (I&TP) with entries for inspections and test due within the 1st 90 days after Notice of Award.
2. Monthly, submit the Inspection and Test Plan updates, adding inspections or tests due within a 90 day forward-looking window of time
3. Prior to performance of special process and acceptance inspections and tests designated as "Hold" or "Witness" points by the Railroad
   - personnel qualification records for personnel who will be performing special process inspections or tests
   - proof of valid calibration of measuring or test equipment to be used in the field shall be submitted to the Railroad's Construction Manager

A.4. RAILROAD'S QUALITY ASSURANCE

A. The Railroad will monitor compliance with the processes established in the QSM and CQP and assess the effectiveness of the system in driving the Contractor's team in achieving quality goals for the contract.

In addition to conducting independent materials testing and Building Code Structural Tests and Special Inspections, at its option, the Railroad may perform audits and other forms of oversight and assessments.

B. The Contractor shall provide access to its facilities, personnel, information, products, and other objective evidence at all reasonable times.

C. The Contractor shall ensure through the Contractor's procurement documents that similar access is allowed by suppliers, sub-contractors, testing agencies, and consultants.

D. Information, products, and other objective evidence in any condition, in-process or finished, acceptable or nonconforming, shall be made available to ensure a

complete view of the state at which the Contractor has implemented its QSM and CQP.

E. The Railroad will notify the Contractor of any deficiencies identified during these activities in writing. If deficiencies are noted, the Contractor must ensure prompt and documented corrective action, including in that corrective action other items or processes similarly affected. The Contractor shall identify root cause and revise, amend, or clarify its CQP or procedures or those of its subcontractors, suppliers and testing agencies, as applicable, also incorporating preventive measures.

F. The Railroad's quality assurance activities shall not negate, delete, lessen, or act instead of the Contractor's quality assurance responsibilities.

A.5. MATERIALS TESTING

A. Independent testing of construction materials is the responsibility of the Railroad's Construction Supervision & Inspection Consultant.

The Contractor and its subcontractors and suppliers shall support implementation of the Railroad's independent materials testing responsibilities.

B. Where the contract requires materials test results for other than testing related to BCNYS Special Inspections, the following information shall be provided:

1. Name and address and contact information of the laboratory where the test was conducted
2. Qualification documentation (i.e. - State license to conduct business as an independent testing agency, information from a U. S. testing laboratory accrediting body (see A.5.C, Qualifications of Testing Laboratories)
3. Identification of the individual who conducted the test
4. Identification of the laboratory supervisor who validated the test and its results
5. The date the test was conducted
6. The test equipment and measuring instrument used
7. The test standard or procedure used and acceptance criteria applied
8. The data obtained by test, leading to the conclusion reported
9. The overall conclusion reached by the testing agency (i.e. – Pass or Fail)
10. The laboratory management personnel who authorized the release of the test report

C. Testing Laboratory Qualifications

1. Throughout their period of engagement, laboratories shall satisfy the requirements of ISO/IEC-17025, *General requirements for the competence of testing and calibration laboratories*, as determined by a U. S. testing laboratory accrediting body[4,5].

2. Throughout their period of engagement, environmental laboratories shall be accredited by the state governmental agency that serves as accreditation body under the National Environmental Laboratory Accreditation Program (NELAP)[6].

A.6. BUILDING CODE SPECIAL INSPECTIONS

A. The Railroad has direct responsibility for Building Code Structural Tests and Special Inspections. Building Code Special Inspections will be conducted by the Railroad, through its Construction Supervision & Inspection Consultant.

The Railroad's Construction Supervision & Inspection Consultant will provide a Registered Design Profession (RDP), licensed and registered in the State where the construction work is located, who shall be responsible for the Railroad's Building Code Structural Tests and Special Inspections and Building Code Compliance inspections. This professional is hereinafter referred to as "The Building Code Compliance Inspector".

B. The Contractor and its subcontractors and suppliers shall support implementation of the Railroad's independent materials testing responsibilities.

PART B. PRODUCTS

1. The Contractor's Company Quality Manual
2. Contract Quality Plan
3. Contract Inspection And Test Plan(for general construction quality control)
4. Personnel qualification and/or certification for those who perform special processes (e.g. – non-destructive examination or testing) in the field
5. Calibration records for measuring or test equipment used in the field for special process and acceptance inspections and tests

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4 National Voluntary Laboratory Accreditation Program, Laboratory Accreditation- NVLAP, 100 Bureau Drive, Stop 2140, Gaithersburg, MD 20899-2000; Email: nvlap@nist.gov Phone: (301) 975-4016, http://ts.nist.gov/standards/scopes/programs.htm and the National Cooperation for Laboratory Accreditation (NACLA) (http://www.nacla.net/).

5 OSHA Nationally Recognized Testing Laboratory (NRTL) Program (https://www.osha.gov/dts/otpca/nrtl/)

6 In NY State, the accreditation body is the NY State Dept. of Health's Environmental Laboratory Approval Program (ELAP, **URL:** www.wadsworth.org/labcert/elap/elap.html)

PART C. EXECUTION

C.1. THE QUALITY MANUAL

A. The Contractor's Quality Management System documentation shall conform to the requirements of the American National Standards Institute's ANSI/ISO/ASQ Q9001-2008 Standard (also referred to as ISO-9001), *Quality Management Systems – Requirements*.

B. The Quality Manual shall also:

1. Identify its applicability to the location(s) where products and services to be provided in this contract are manufactured or headquartered,
2. State the Consultant's policies regarding the control of development and/or installation of deliverable software and provide references, should details of this information exists in a separate document,
3. Include a roster or chart of personnel responsible for implementing the company's quality policies,
4. List or reference to implementing procedures governing activities important to the management of quality, such as:
    a. Control of Records
    b. Nonconformance Control
    c. Action to correct Quality Management System deficiencies
    d. Action to prevent Quality Management System deficiencies
    e. Internal audit
5. Bear evidence of approval by the authority in charge of the business unit.

C. Prior to award, the Consultant shall obtain the Railroad's agreement with amendments, exceptions, or modifications to the Consultant's company quality management policies and Software Quality Assurance Plan that are necessary for this Contract. These shall be incorporated into the Consultant's Contract Quality Plan.

D. **Optional Quality Manual Template**

At the end of this Section 01 43 00, QUALITY MANAGEMENT SYSTEM REQUIREMENTS is a template for preparing a Quality Manual. Contractors that do not have a documented Quality Manual or that have a manual reflecting a quality system that does not meet ISO 9001 may opt to use the template. Note: No representation is made regarding the acceptability outside Metro-North Railroad of a manual developed using this model.

C.2. CONTRACT QUALITY PLAN (CQP)

The Contractor shall implement a Contract Quality Plan to ensure that its work is adequately planned, coordinated, and in accordance with this Contract and the professional standard of care committed to by the Contractor's company management. At a minimum, it shall address:

A. ADJUSTMENTS TO THE COMPANY QUALITY MANAGEMENT POLICIES APPLICABLE ONLY TO THE CONTRACT

B. PROJECT ORGANIZATION AND MANAGEMENT
   1. Include a roster or chart of personnel responsible for implementing the Contract Quality Plan's requirements.
   2. Include a list of any Customer-specific procedures applicable to the Contract

C. USE OF WRITTEN PROCEDURES
   Internal procedures for control over the quality of design documents and technical submittals (e.g. – inter-discipline review, review, design change process, process for release of design documents for submittal to the Railroad, record keeping, internal audits, field inspections and surveys, correspondence control, etc.)

D. PROCUREMENT CONTROL
   1. Sub-contract quality management system requirements
   2. Sub-contract quality oversight

E. DOCUMENT CONTROL
   1. Requirements documents shall bear evidence of approval by the authority
   2. Contract Correspondence Control
   3. Tracking of RFIs and Change Requests
   4. Internal review of technical submittals
   5. Shop Drawing Approval Process Tracking
   6. Control of approved construction documents (including changes) at the Jobsite

F. CONTROL OF FIELD CHANGES

G. QUALITY CONTROL AT THE JOBSITE
   1. Contractor's own work
   2. Subcontractor work
   3. Inspection and test records
   4. Quality of materials in storage
   5. Housekeeping

H. NONCONFORMANCE CONTROL (including processing of rejected materials)

I. INTERNAL QUALITY SYSTEM AUDITS

J. RECORDS RETENTION WHILE WORK IS IN PROGRESS
   1. Loss prevention

2. Disaster recovery
3. Information pertinent to as-built records

K. FORMS or template/format for quality management to be used on the contract (e.g. - Inspection Reports, Test Reports, and Nonconformance Reports).

C.3. CONTRACTOR'S INSPECTION AND TEST PLAN

The Contractor's Inspection and Test Plan shall cover verification of conformance to the technical specifications and construction quality control. It shall provide the following information:

1. List all inspections and testing required in the Contract, including those required by referenced Codes and Standards.
2. The schedule of when the activity is expected to be carried out
3. The source of the inspection or test criteria (e.g. - drawings, specifications, inspection or test procedure),
4. The status of these criteria documents (e.g. - approved, in process, etc.),
5. The party responsible for conducting the inspection or test
6. The Railroad's participation (e.g. - witness or conduct the inspection or test),
7. The status of the item after inspection or test (e.g. - passed, with open items pending, or failed), and
8. The status of final records (e.g. – In-progress, release transmittal ID/date of issue).

C.4. BUILDING CODE SPECIAL INSPECTIONS

A. Responsibilities Of The Construction Contractor

1. *Notify the SI.* The holder of the building permit or their duly authorized agent shall notify the SI of individual inspections required. Adequate notice to the SI shall be provided so that all prerequisites (e.g. – Railroad-accepted design documents, and Railroad-approved shop drawings, utilities and services) are in place or have been completed and the SI has time to become familiar with the specific items and acceptance criteria.
2. *Provide safe access to the work to be inspected.*
3. *Provide support for the efficient and safe performance of SI activities.* Provide jigs, fixtures, handling equipment, lighting, and other equipment.
4. The Contractor shall ensure that its jobsite activities do not interfere with or negate completed Structural Tests and Special Inspections. Change to a tested or inspected item, may be reason to retest or re-inspect. The authority for such determination shall be the Railroad's Project Manager or designee.
5. *Field discrepancies*. The Contractor shall implement approved remedial measures to noncomplying items. The Contractor shall obtain CEO approval of remedial measures for items that do not comply with previously-approved drawings prior to implementing these remedial measures.

6. *Changes to Design Documents and Shop Drawings*. The Contractor shall obtain the approval of the Railroad's Designer-of-Record and CEO to proposed changes to previously-approved drawings prior to implementing these changes.
7. *Provide access to the approved Structural Tests and Special Inspections criteria.* The contractor/construction manager shall provide the SI with direct access to the Structural Tests and Special inspection criteria agreed to with the Railroad.

B. Cognizant representatives from the following organizations shall be present during Special Inspections:

1. The construction contractor's and affected sub-contractor's site supervision and construction inspectors
2. Authorized field service representatives of suppliers of major equipment with safety-related functions.

C. Building Code Special inspections shall be coordinated with the Contractor's contract Inspection & Test Plan for general construction quality control as well as its commissioning and systems integration plan.

D. Upon completion of the inspection, all authorized representatives shall:

1. Go over exception items, identifying those that are product or installation nonconformance, as appropriate
2. Act in good faith to reach agreement regarding disposition and correction of nonconforming conditions,
3. Identify open items, determine the next step, identify the responsible party, and establish action due date towards resolving the open items, and
4. Acknowledge participation and understanding of the Nonconformance Reports and Open Action Items summary by signing each record.

E. At their option, Metro-North Code Compliance and other responsible oversight organizations may elect to participate in any Special Inspection activities.

F. The Contractor, its sub-contractors, and suppliers shall provide support for Building Code Compliance activities.

C.5. BUILDING CODE SPECIAL INSPECTION RECORDS

A. Once all Nonconformance Reports have been closed and Open Action Items completed, The Building Code Compliance Inspector shall release the final inspection records in accordance with the Metro-North Code Compliance Manual (Ref. 3). The Metro-North Code Compliance Group issues Certificates of Occupancy also in accordance with the Metro-North Code Compliance Manual (Ref. 3).

B. These records shall also be retained in files intended for transmittal to the Railroad's project long-term records retention.

C.6. SOFTWARE QUALITY ASSURANCE

A. The level of Railroad involvement in software development is established by the designated agency Engineer. Through the contract technical specifications or directive provided during the contract period, the Engineer may modify the applicability of the requirements of IEEE 1558 in a manner appropriate for the scope and criticality of the work to safety or agency needs.

The Contractor shall implement Software Configuration Management during procurement, receipt, installation and commissioning of systems shall be addressed.

B. Prior to placing software in service, the Contractor shall test software for operability and that it functions as expected.

C. **Configuration Control**

1. An appropriate document and data control methods shall be established to ensure that software products in development are identifiable and kept separate from software products intended for installation in a Railroad system.

NOTES:

i. Software in development that is released for testing on equipment or systems prior to final release shall be identifiable and contain appropriate statements within the software code to indicate its release status to users.

ii. Software in development that is released for testing on Railroad equipment or systems prior to final release shall be:

- Authorized in writing by the Engineer,

- Replaced with the final, released version, with documentation complying with the appropriate type of implementation.

iii. An appropriate document and data control methods shall be established to ensure that the latest set of released-for-installation software products are identifiable and are the only products available for installation.

2. These configuration control requirements are in addition to any other requirements for software identification and traceability to hardware prescribed in other parts of the technical specifications.

3. The Consultant shall update these documents periodically until the end of the contract period.

D. **Commercial-Off-The Shelf (COTS) Equipment with Software**

When software is included as part of Commercial-Off-The Shelf (COTS) equipment, software documentation shall conform to the requirements in IEEE-1558-2004 for Type 1 procurement:

1. Details regarding the software identification, version and level shall be provided to the Railroad.

2. User's Manuals and all other documentation from the original source of software shall be provided to the Railroad.

End of Section 01 43 00

PART D. ATTACHMENTS

D.1. OPTIONAL QUALITY MANUAL TEMPLATE

FOREWORD

INTRODUCTION

A quality management system is intended to assure that construction services are provided safely, as specified, on schedule and at the agreed cost.

This Model Quality Management System Manual **(Model QMS Manual)** is a template designed for use by Consultants that want to develop their own company Quality Management System Manual **(Company QMS Manual).** This Sample QMS Manual is patterned after ISO 9001-2000 Quality Management System Requirements. However, this Sample QMS Manual is in no way intended to restrict the format of Quality Manuals submitted to Metro-North. You may develop your Company QMS Manual in any format that satisfies the requirements of ISO 9001-2000.

The interpretations of ISO 9001- 2000 requirements in this Sample QMS Manual are general in nature: Metro-North Railroad makes no representation regarding its acceptability, accuracy and correctness outside Metro-North. In addition, you must evaluate its contents as they apply to your own organizational structure. If you intend to use this sample as the basis for Third Party registration, the opinion of your registrar or reviewing agency takes precedence.

CONTRACT QUALITY PLANS

The quality management policies in your Company QMS Manual may need to be amended, or modified in some suitable way for specific contracts to accommodate special Customer requirements, and to define organizational and administrative interfaces between The Company and The Customer. It is typical to call these amended or modified Quality Manuals "Contract Quality Plans". There have been a number of common practices regarding Quality Plans. Some practices have been to:

- Incorporate the modifications into a contract-version of the Company QMS Manual,
- Issue the Company QMS Manual with an attached amendment containing the modifications applicable only to a specific contract, or
- Issue a separate document called "Contract Quality Plan" containing only the modifications and referencing a specific version of the Company QMS Manual as the base document, and transmitting the base version of the Company QMS Manual with the Contract Quality Plan.

USE OF GENERIC TITLES

The title "Chief Operating Officer" (COO) refers to the position of the highest-ranking individual responsible for the day-to-day operation of the entire company. You may substitute the appropriate title for your company (e.g. - President).

The title "Construction Contract Officer" refers to the position of the highest-level individual responsible for the successful conclusion of a Construction Contract and satisfaction of the customer. You may substitute the appropriate title for your company (e.g. - Project Manager).

The title "Designated Responsible Officer" refers to the position of an individual at a Construction job site responsible for successful conclusion of construction work and satisfaction of the Customer. You may substitute the appropriate title for your company (e.g. - Site Superintendent).

In some cases, an explanation of the requirements of ISO 9001-2000 is given for clarity and to aid understanding. The explanation is in Italics and is not part of sample text.

We hope you find the Sample QMS Manual a useful step in your journey to achieve a high level of customer satisfaction and a more profitable future.

- oOo -

(Insert company name here)
(Insert company headquarters street address here)
(Insert City/Town, State and Postal Zip-code here)

QUALITY POLICY AND QUALITY MANAGEMENT SYSTEM DESCRIPTION
OR
CONTRACT QUALITY PLAN
OPTIONAL TEMPLATE

_____ _____
PRESIDENT DATE

_____ _____
(indicate actual company title) DATE
Senior management representative for quality

REVISION NO.____
EFFECTIVITY DATE _____

TABLE OF CONTENTS

SECTION 1 - QUALITY MANAGEMENT SYSTEM

(This QMS Section corresponds to Section 4 of the ISO 9001-2000 Standard. It describes the overall Quality Management System (QMS), and identifies those processes, procedures and other documents that ensure effective operation and control of processes.)

1.1 General Requirements

The ***(insert company name here)***, henceforth known as "The Company", is committed to establishing, implementing, maintaining and continually improving a QMS conforming with the requirements of the International Standard, ISO 9001-2000. This Manual documents the policies of that QMS.

The following are the key processes needed for the QMS to be effective and facilitate the production of a product or service that satisfies the customer. **(*Note this is not a complete list and should be modified to address your company structure and operations.)***

1. The Contracting Process

   This is process starts with the review of the Request For Proposal (RFP) or Information For Bidders (IFB), through proposal or bid development, Customer's award of the Contract or notification of no award, and ending with review of opened proposals or bids.

2. Design and Development

   This is the process of inter-discipline and inter-organizational effort of transforming the Customer’s contract Technical Provisions into design and construction documents such as Design Specifications, drawings, shop fabrication details, inspections and test procedures.

3. Shop Drawing Submittal, Review and Approval

   This process starts with the contract kick-off meeting. Describe the Consultant's process for obtaining Customer’s input to and approval of technical submittals and deliverables, such as construction details, shop fabrication drawings, workmanship standards, special process procedures, and inspection and testing procedures.

4. Production Planning

   This process consists of the development of the construction work breakdown structure, cost-loaded schedule, database and method for progress reporting, establishment of the system and rules for communication and coordination between the Company's project team and the Customer's project team.

5. Procurement

This process consists of identification, procurement, and traceability of materials, parts, components, equipment, and services, including the activities of selecting suppliers, sub-contractors, testing agencies and consultants.

6. Construction

This process includes all activities defined in the contract technical provisions, contract drawings, and Customer-approved shop drawings.

7. Monitoring and Measuring

This includes several processes: product inspection at source, construction work inspection, in process testing, post-construction pre-operational testing, control of nonconforming conditions, and Quality system internal audits.

8. Customer Satisfaction and Quality System Improvement

This is a set of processes that includes corrective and preventive actions, company management review of quality system effectiveness and suitability, and response to customer returns, complaints and feedback.

For each key process identified above, The Company will identify the criteria and methods to ensure the processes are effective, define the methods of monitoring measuring and analyzing these processes and establish commitment to their continuing improvement.

(*Note: The criteria and methods referenced above, may be included in the Company QMS Manual, a contract Quality Plan (See Foreword to this Sample QMS Manual) or, separately, in procedures, work instructions or process control documents.)*

1.2 Documentation Requirements

1.2.1. General

The Company has established the following documentation for its QMS.

(List the types of written or electronic information that provides direction, guidelines, acceptance standards, processing standards, and similar requirements. What follows are typical written requirements that may be applicable to your company's operation. Remove those that are not applicable and add those that apply but may not have been listed here)

a) This Quality Management System (QMS) Manual
b) Quality Management System Procedures (administrative)
c) Project Management Procedures (including interface and coordination with Customers and regulatory agencies with jurisdiction over jobsites)
d) Government regulations
e) Customer contracts, including contract specifications and drawings

f) Industry standards
g) Procurement specifications
h) Processing Instructions (including construction process instructions)
i) Construction Work Packages
j) Measuring and test equipment calibration procedures
k) Inspection and test procedures

Records that demonstrate implementation and effectiveness of the QMS are identified in quality system documentation.

1.2.2. Quality Management System Manual

This Company QMS Manual establishes the scope of the Quality Management System, defines the activities and functions over which it applies, and commits to complying (and any exclusion) with the International Standard ISO 9001-2000. It describes the sequence and interaction of the main administrative processes, which fall under the scope of the QMS and cites references to lower-tier quality system documents when more details are necessary.

The ***(insert the title of the individual who has primary responsibility for Company QMS Manual and for publishing and issuing copies to users)*** shall ensure that master version of the Company QMS Manual and copies sent to direct users are controlled documents. (See 1.2.3 "Control of Documents", following).

1.3 Control of Documents

A documented procedure has been established to control documents required for the QMS. The written procedure detailing the Company's document control practices is listed in Appendix 6.1 of this Company QMS Manual. This procedure implements the following policies:

a) Written requirements that make up QMS (see Quality System requirements documentation in 1.2.1) shall:

- Exhibit those characteristics necessary to establish that any available copy is the correct document, approved, complete, and current.
- Be reviewed and signed by authorized personnel prior to release.
- Be sent to each user or to locations readily accessible to each user
- Be maintained current and useable in any location where copies are stored.

b) Personnel who work in activities governed by the QMS shall use only the latest, authorized, controlled issues of QMS documents.

c) Superseded versions of these documents shall not be held or stored in areas where inspection, test, or construction work is in-progress. Wherever these other versions are stored, they shall be marked clearly as not authorized for use (e.g. - "void", "superseded").

1.4 Control Quality of Records

The applicable procedure, listed in Appendix 6.1 of this Company QMS Manual, to control the identification, review, approval, distribution, retention, and retrieval, protection, and disposition QMS records has been established. This procedure implements the following policies:

Records shall be verified for accuracy and completeness prior to final release and retention.

Records (e.g. - letters, memos) that require a response or action shall be directed to the individual authorized to respond or act.

The status of transmittals that require a response or action by shall be maintained.

Records shall be stored in a suitable environment to prevent damage or deterioration and to prevent loss. Records shall be filed according to the established File Index.

Access to records shall be controlled. Removal of Records to a location other than the immediate area where the file is located shall be restricted to authorized persons. Measures to identify removed files and their current location shall be maintained.

Retention time of QMS records shall be established in a written procedure.

- END SECTION 1 -

SECTION 2 - MANAGEMENT RESPONSIBILITES

(This QMS Section corresponds to Section 5 of ISO 9001-2000. It addresses commitment to quality, consideration of the customer, Quality Policy, planning work to deliver a quality product, administration of the Quality Program, and positioning for continuous improvement.)

2.1 Management Commitment

At its highest management levels, the Company is committed to the development and improvement of the QMS by:

a) Communicating the importance of meeting customer, regulatory and legal requirements.

b) Establishment of a quality policy and objectives.

c) Conducting management reviews in accordance with Paragraph 2.6 of this Company QMS Manual

d) Ensuring the availability of resources necessary to implement company policies and attain its quality objectives.

2.2 Customer Focus

The Company ensures Customer satisfaction by:

a) Reviewing and clarifying Customer's Contract Requirements against Customer's and The Company's expectations.

b) Establishing close coordination in a systematic way through a contract Quality Plan that provides necessary modifications to company standard operating procedures to accommodate Customer needs.

c) Assigning trained and qualified personnel to carry out project tasks, and continuously maintaining skill levels and qualification.

d) Breaking down work elements, budget and available time in sufficient detail to track real progress and meet cost, quality and schedule commitments.

e) Performing internal quality audits to encourage compliance with the QMS requirements and determine how effective these requirements are in assuring long-term profitability and Customer satisfaction.

f) Systematically identifying and resolving nonconforming conditions before they impact the Customer, and using that information together with Customer feedback to improve the Company's ways of doing business.

2.3 Quality Policy

The Company policy regarding the Quality of the goods and services we offer our customers is in Appendix 6.2 of this Company QMS Manual.

This Quality Policy is reviewed for relevancy and appropriateness of objectives; and communicated to those performing the work. The policy is posted at all work locations.

(Prepare a statement, called "Quality Policy", that is appropriate to your company's business objectives, include commitment to meeting Customer requirements, continuously improving the services provided, and the method of delivering these services. Attach that statement, as Appendix 6.2, to this company Quality Manual).

2.4 Planning

2.4.1 Quality Objectives

The Company's Quality Objectives are in Appendix 6.3 of this Company QMS Manual. The attainment of our Quality Objectives is part of our commitment to continuous improvement and Customer Satisfaction. The Quality Plan for any Construction Contract will identify quality objectives for that construction contract.

2.4.2 Quality Management System Planning

QMS planning is a yearly activity that occurs as part of the company's budget development process and results in obtaining management approval of staffing, budgets and schedule to carry out:

a) Necessary modifications to the written requirements documents to incorporate lessons learned from quality system audits, corrective/preventive action issues, and management review,

b) Reallocation of staff responsibilities and hiring of additional personnel in order to efficiently and completely accomplish quality system (including contract-related) activities, and

c) Procurement of necessary additional assets (e.g. - office space, equipment, service contracts, etc.) and services to maintain current assets in a state of good repair

d) Processes in this Company QMS Manual.

When conditions require change, the planning process allows change to occur in a controlled manner and integrity of the QMS is maintained. The COO authorizes changes to the QMS and assures the information is disseminated and adequate resources for implementation and control during the transition are available.

2.5 Responsibility, Authority and Communication

2.5.1 Responsibility and Authority

The Company is organized in the following manner. *(Include Appendix 6.4, the organization chart for the company). (Insert title)* is responsible for maintaining the company Organization Charts (Appendix 6.4). The contract Quality Plan will also include the Organization Chart for the Construction Contracted product or services.

The Company has assigned responsibilities and authority in the following manner.

(Use functional titles instead of names to reduce the number of Company QMS Manual revisions. Focus your description of activities on prevention of nonconforming conditions, problem identification, problem solution, verification of corrective action, and follow-up to ensure problem resolution. Correlate with the Organizational Chart.)

2.5.2 Management Representative

The Company has assigned a management representative for Quality. He/she shall ensure the Quality system is established, maintained, and implemented and shall report to top management on *a twice-yearly basis* and make recommendations for Quality System improvements. Reports shall be issued in writing to Top Management and maintained in an open status until the resolution of outstanding items. The management representative for Quality shall be independent of direct project supervisory activities and assure that for each Construction Contract assigned personnel are aware of customer requirements.

2.5.3 Internal Communication

The Company ensures effective communication including communication of the effectiveness of the QMS through one or more of the following:

Distribution and control of procedures, work instructions, flow diagrams, process diagrams, newsletters, and the establishment, monitoring and communication of quality goals and their status.

2.6 Management Review

2.6.1 General

The Company top management shall review the QMS, quality policy and quality objectives twice a year and more often as needs dictate to ensure its suitability, adequacy and effectiveness. Records of these reviews shall be maintained. The COO is responsible for the Management Review process.

2.6.2 Review Input

Management Reviews shall utilize:

a) Internal and external Quality Audit results
b) customer performance evaluations (feedback)
c) Process performance and product conformance results

d) Preventive and corrective action status
e) Follow up on actions from previous Management Reviews
f) Other changes (i.e. business climate, scope of work changes, etc) that could affect the QMS.

2.6.3 Review Output

Results of company management's review of the QMS shall be recorded and address the following, as appropriate:

a) Improvements in the QMS and its processes
b) Improvements in product related to customer requirements
c) Resource needs

Action items shall be followed up at subsequent management reviews to ensure closure.

- END SECTION 2 -

SECTION 3 - RESOURCE MANAGEMENT

(This QMS Section corresponds to Section 6 of ISO 9001-2000. Its purpose is to assure that sufficient staff and assets are assigned to the work governed by the QMS and that staff is adequately prepared to perform the assigned tasks.)

3.1 Provision of Resources

The Construction Contract Officer and Designated Responsible Officer are responsible for assessing organizational and project needs within their specified scope, including oversight functions. Each shall identify sufficient resources necessary to deliver construction services as required by contract and improve the QMS processes. When necessary, additional resources shall be provided.

3.2 Human Resources

3.2.1 General

The Company shall assign work to personnel who are competent on the basis of applicable education, training, skills and experience. The Construction Contract Officer is responsible to review requirements to determine any special competency needs for personnel assigned to a specific Construction Contract and ensure the assignment of personnel who meet the requirements.

3.2.2 Competence, Awareness and Training

The Company shall:

a) Identify competency needs for personnel performing activities affecting quality. The Company has developed position descriptions for those personnel performing activities affecting quality, which identify competency requirements*. (Identify the appropriate position in your company)* maintains the latest issue of such position descriptions.

b) Identify training needs, provide training to satisfy competency needs, and assure continuing training is provided as necessary *(Note training can be formal, informal, on the job, union classes, apprenticeship, etc).*

c) Evaluate the effectiveness of the training provided. Individuals who are responsible to supervise personnel performing the work will evaluate effectiveness. One or more of the following will correct any noted deficiencies: additional On-the-Job-Training, closer supervision, formal re-training, and reassignment.

d) Ensure employees are aware of how their work activities contribute to the achievement of quality objectives. Our Quality Policy is posted at all work locations. Employee orientation contains a section that describes the important role each employee plays in achieving both our corporate and Construction Contract quality objectives.

(Describe how you achieve this. Consider newsletters, performance evaluations, project Kick-off meetings, Project position descriptions, project organization charts and other means of awareness enhancement).

e) Maintain records of education, training skills and experience. Human Resources is responsible to maintain appropriate records including records of training activities and the subject matter.

3.3 Infrastructure

The Company provides a work environment suitable for it to achieve its business objectives and satisfy project requirements. The COO or designee is responsible to assure necessary facilities, equipment, hardware, software, support/administrative services are available to each employee in order to assure they can be successful in their work.

3.4 Work Environment

The Company has identified and is managing those factors of the work environment needed to assure work output is acceptable.

These factors may include, as applicable, safety plans and inspections, compliance with OSHA and applicable building codes, toolbox meetings, HAZMAT protective equipment, and specific requirements in Construction Contracts.

- END SECTION 3 -

SECTION 4 - PRODUCT REALIZATION (PLANNING AND PERFORMANCE OF WORK)

(***This QMS section corresponds to Section 7 of ISO 9001-2000. It describes those activities related to the production of a product to ensure that it meets customer requirements. Products can be physical (e.g. - structures, equipment, parts, and materials) or intellectual (e.g. - studies, analysis, design plans and specifications, and software). Intellectual product may be of direct use to the customer or incorporated into a final product or service for the customer****.)*

4.1 Planning of Product Realization

The Company shall plan and document the product realization process. The documentation for the realization process may be described in a Contract Quality Plan, product design, and production process documents.

The Quality objectives for the work are identified in the Construction Contract and represent the customer requirements or in product specifications for standard product.

The process, process controls, documentation, and resources necessary to complete the work successfully shall be established and implemented.

Verification and validation are incorporated into the planning process and are described in the contract Quality Plan or product testing documents. Acceptance criteria shall be developed, and product acceptance documented.

Records attesting to conformity of process and resulting product shall be maintained. Records will include:

- Monitoring and Measuring Records
- Internal Quality Audit results and closure
- Product Acceptance Records
- Records of Management Reviews

4.2 Customer Related Processes

4.2.1 Determination of Requirements Related to the Product

The Company will carry out construction in accordance with the Construction Contract (or produce industry-standardized items strictly in accordance with the applicable industry standard). Where written Customer requirements are not provided, the Company will document requirements provided verbally by the Customer, as well as any additional requirements, such as regulatory and legal requirements, necessary to build structures (or produce product) acceptable to the Customer.

4.2.2 Review of Requirements related to the Product

The Company will review Construction Contracts and other forms of written Customer requirements with the Customer to ensure that the expectations are clear and

understood. Relevant parts of the Customer's requirements will be reviewed with each party within the Company and subcontractors to ensure that and that the Company and its subcontractors have the capability of performing the work as specified.

Prior to signing a Construction Contract a review shall be performed to ensure any agreed to changes have been incorporated. The review shall be documented. The process is under the supervision of the COO or designee.

Changes to Construction Contracts shall be processed and controlled in the same manner as the original contract. Changes shall be documented and issued to all staff and subcontractors responsible for its execution.

These processes are under the supervision of the COO, Project Sponsor or designee. These reviews shall be documented.

4.2.3 Customer Communication

The Company will establish and maintain communication with the customer regarding the Construction Contract and the work activities. The COO will assign a responsible officer to be the point of contact and coordination for the Construction Contracts. A communication process will be established agreeable to both parties and shall be uniformly implemented. Those responsible for liaison with the Customer shall keep the Customer informed of progress and special conditions that arise. Customer survey data will be used for standard products.

Customer feedback/complaints shall be evaluated and response provided in writing.

4.3 Design and Development

(***Identify the planning tools for managing and coordinating design and development, such as - resource-loaded schedule, CPM, Bar Charts, Flow diagrams, etc).***

4.3.1. Design and Development Planning

The Company shall develop a plan to control the design and address staging, review, verification, and validation activities, personnel responsibilities and authorities, interfaces between discipline and any update in this plan during production.

During the planning, the organization shall determine

The design and development stages,
The review, verification and validation that are appropriate to each design and development stage, and
The responsibilities and authorities for design and development to ensure effective communication and clear assignment of responsibility.

4.3.2. Design and Development Inputs

Inputs relating to design requirements shall be determined and records maintained. These inputs shall include:

a. Functional and performance requirements,
b. Applicable statutory and regulatory requirements
c. Where applicable, information derived from previous similar designs, and
d. Other requirements essential for design and development.

The COO will assign a Contract Officer to review the Contract and determine functional and performance requirements, applicable statutory and regulatory requirements, investigate the applicability of a similar design, and any other requirements necessary to assure the contract can be successfully completed. For Standard items the COO will assign a Responsible Officer to determine appropriate design and development inputs.

These inputs shall be reviewed for adequacy and be complete, unambiguous and not in conflict. These inputs shall be in written form and, once reviewed and found acceptable, transmitted to the appropriate responsible designer.

4.3.3. Design and Development Outputs

Outputs are those deliverables required by the customer in the Contract or those specified for standard items or needed by our production department to manufacturer product and include, but are not limited to, studies, reports, analysis, scope development, designs and specifications.

Outputs of the design process shall be in a form that enables verification against design inputs and shall be approved prior to release.

The assigned Contract Officer or Designated Responsible Officer is responsible for ensuring that design and development outputs:

a. Meet the design input requirements,
b. Provide appropriate information for purchasing, production and servicing,
c. Contain or reference acceptance criteria for product or installation, and
d. Specify the characteristics of the product that are essential for its safe and proper use.

4.3.4. Design and Development Review

Design Documents are circulated for internal review and coordination of all units with input to the end product. The number of reviews is dependent on the complexity of the work and will be identified in the planning process.

The review process shall address the ability of the design to fulfill requirements and identify problem areas and proposed corrective actions.

Comments shall be addressed in written form, and records of resolution kept until completion of the Contract or per record keeping requirements for standard items. The

management team member responsible for the design effort will ensure closure for all comments

4.3.5. Design and Development Verification

The assigned contract officer or designee is responsible to assure the design output is consistent with the design inputs.

Verification will be performed to planned arrangements developed under 4.3.1. The contract specific QMSM will address Contract specific applications.

4.3.6. Design and Development Validation

The Company has developed a system to assess if the design was constructible or capable of being manufactured and met customer requirements and was suitable for its intended use.

The results of FAI may be used, if applicable, for validation.

The results of the validation effort are recorded and used as part of our Corrective and Preventive Activities Program.

4.3.7. Control of Design and Development Changes

General

Design and development changes shall be identified and records maintained. The changes shall be reviewed, verified and validated, as appropriate, and approved before implementation. The review of design and development changes shall include evaluation of the effect of the changes on constituent parts design already completed.

Requests from the construction site for clarifications and revisions to design documents shall be documented reviewed by the Designated Responsible Officer, the Contract Officer, and the Chief Estimator before being sent to the Customer for review and approval. Methods have been established to ensure revisions are reviewed to the same level as the original documents for the area of change. Records of these activities shall be maintained.

Upon receiving revised design documents, these documents shall be placed under document control to prevent inadvertent use. Superseded versions shall immediately be removed from controlled documents centers and specific work locations.

4.4 Purchasing

4.4.1 Purchasing Process

Prior to engaging suppliers or subcontractors to perform part of the Contract work or furnish materials, their capability to perform the assigned scope of services shall be evaluated. The performance of suppliers or subcontractors engaged to accomplish parts of the Contract work or furnish materials shall be monitored and assessed

(***Indicate the frequency of evaluation***). Records of these evaluations shall be maintained. Evaluation criteria shall be defined. The COO or Designated Responsible Officer shall oversee this process and is responsible for following up on identified areas of poor performance.

Records of supplier or subcontractor performance shall be maintained. Suppliers or subcontractors with a record of poor performance shall be excluded from future consideration.

4.4.2 Purchasing Information

Purchase Orders define product requirements (e.g. - performance, functional, physical, inspections and test in sufficient detail to ensure that the furnished item meets the purchase order requirements. Purchase Orders will include appropriate QMS requirements. The assigned Construction Contract Officer, Responsible Officer or designee will review all supplier/ subcontractor purchase orders prior to release.

4.4.3 Verification of Purchased Product

The Company has a program to verify that systems, components, parts, and materials provided by suppliers meet the Purchase Order requirements. The Purchase Order identifies verification to be conducted. A Contract Inspection and Test Plan will identify all milestone inspection and tests required by contract for suppliers of major equipment, components, or critical fabricated items.

4.5 Production (Construction) and Service Provision

4.5.1 Control of Production and Service Provision

The Company has established the following controls applicable to their work.

a) Activities are planned

b) Activities are scheduled

c) Acceptance criteria are defined

d) Adequate resources (tools, equipment, and trained personnel) are available to perform the work.

e) The work environment is safe and conforms to applicable Regulatory Requirements.

f) Methods are employed to monitor work against expected results

g) Applicable portions of the Construction Contract, procedures, work instructions, installation practices that are important to ensure quality work are available to the work force

h) Codes standards and other references are available to the work force

i) Standards of workmanship are defined

j) Where required, licensed or certified personnel are assigned to perform activities requiring such license or certification

k) A program to monitor the effectiveness of these process controls is in place and implemented.

l) Criteria for release, approval, or acceptance are established

4.5.2 Validation of Processes for Production and Service

The validation of certain processes can only be determined when it is operated. These processes will be identified in specific for each Contract as part of a contract Inspection And Test Plan.

The Company assures these processes can achieve planned results through one or more of the following:

a) Process qualification
b) Equipment and personnel qualification
c) Defined methods and procedures
d) Processing of production samples (i.e. - First Article Inspection)
e) ***(Others: Please state particulars regarding these).***

4.5.3 Identification and Traceability

The Company has developed and maintains a system to identify its fabricated products and purchased materials so that these remain traceable to the original batch of raw materials used and the specifications to which these were fabricated. Items specially intended for a specific customer as identifiable as such. To the extent traceability is a Contract legal or regulatory requirement, the Company will apply this system using unique identification of product or batches.

The Company shall also identify the status of the fabricated products and materials with regard to monitoring and measurement results during construction.

4.5.4 Customer Property

(Note: This section is not applicable to the contract Quality Plan, if no customer-supplied property is in the Contract.)

Customer property includes hardware (such as materials, parts, components and equipment), software and other items provided by the Customer for the express purpose of producing items under the Contract. This includes real property provided for work staging, temporary storage, shop fabrication, and office space The Company shall develop and maintain a system to receive, log, and maintain Customer property, as appropriate. The Customer will be advised of any items that are unsuitable for use, lost or damaged from the time they are received until such property has served its

intended purpose or returned to the Customer.

4.5.5 Preservation of Product

The Company shall establish, maintain and implement a program for handling, storage, packaging, and preservation of items while in its custody, and for delivery of materials and equipment to the Customer. In particular, records shall be available to demonstrate how handling equipment is maintained in safe working order,

4.6 Control of Monitoring and Measuring Devices

The Company shall establish, maintain and implement a program to identify, control and calibrate measurement and monitoring devices used to assure conformity of its products.

The Program shall contain the following elements:

a) Identification of equipment & instruments that require calibration to maintain capability
b) Listing of such equipment & instruments, frequency of calibration and evidence calibration took place
c) Availability and use of manufacturer's instructions, codes or national standards for calibration
d) A program of corrective action to repair or replace items which do not meet acceptance criteria.
e) A program to ensure measuring and monitoring devices are protected from damage deterioration and unauthorized alteration of settings.
f) A program of corrective action for previously accepted product, if defective equipment and instruments were used to inspect or test the product.
g) Confirmation that computer software used as a basis of product acceptance is acceptable for the intended application. Confirm prior to use and as necessary thereafter.
h) Records to demonstrate calibration and verification.

- END SECTION 4 –

SECTION 5 - MEASUREMENT, ANALYSIS AND IMPROVEMENT

(*This section corresponds to Section 8 of ISO 9001-2000. It addresses the methods used to measure, report and improve on both the performance and effectiveness of your processes and the ability of these processes to deliver products that satisfy the customer. It also addressed the need to collect and use data on customer satisfaction, nonconformance etc. to address improvement issues.)*

5.1 General

The Company has defined, planned and implemented measurement, monitoring, analysis and other activities needed to assure conformity, and achieve product and construction service improvement. These activities include:

a) Customer satisfaction surveys
b) Internal Audits
c) In process reviews/inspections/tests/statistical techniques
d) Control of nonconformance
e) Data analysis
f) Corrective, preventive and improvement activities

5.2 Monitoring and Measurement

5.2.1 Customer Satisfaction

The Company has developed methods to obtain data and monitor customer satisfaction and/or dissatisfaction. The assigned Contract Officer, Designated Responsible Officer or designee shall be responsible to assure the data is included as part of the Management Review.

5.2.2 Internal Audit

(Note: Reference to or inclusion of a documented procedure covering Internal Audit is required.)

The Company shall establish, maintain and implement an Internal Quality Audit Program to verify that quality activities and related results comply with planned arrangements and to determine the effectiveness of their Contract Quality Plan and associated procedures. Procedure, listed in Appendix 6.1 of this Company QMS Manual, has been issued covering the Internal Quality Audit Program. The program has the following attributes:

a) Internal quality audits shall be scheduled based upon status and importance of the activity to be audited.
b) Those conducting the Internal Quality Audits shall be competent to conduct audits.
c) A person(s) independent of those directly engaged in the audited activities shall conduct the Internal Quality Audits
d) Reports of the results of Internal Quality Audits shall be generated and issued. Company management, shall receive copies of the Reports.

e) The Audited party is responsible to correct deficient areas promptly
f) Corrective Action shall be monitored and brought to closure
g) Follow-up Internal Quality Audits shall be conducted, as appropriate, to ensure implementation of Corrective Action and the results reported to top management.
h) The activities of subconsultants/subcontractors working under this Company QMS Manual shall be included in the Internal Quality Audit Program.

The COO is responsible to assure implementation of the Internal Quality Audit Program.

5.2.3 Monitoring and Measurement of Processes

The product realization processes described in Section 4 of this Company QMS Manual necessary to achieve customer requirements are measured and monitored.

These methods shall confirm the continuing suitability of each process to satisfy its intended purpose. When planned results are not achieved corrective prevention actions shall be taken to assure conformity.

5.2.4 Monitoring and Measurement of Product

The Company shall establish, maintain and implement a program to monitor and measure the characteristics of its products to verify product requirements have been met. This shall be documented in a contract Inspection And Test Plan.

These efforts will take place at various stages of product development based upon a preplanned product production program. Monitoring and measuring data and records will be maintained. No product will be released until all planned arrangements are satisfactorily completed. Exceptions may be authorized by the Construction Contract Officer or Designated Responsible Officer and by concession of the customer. For standard product the customer shall be notified in writing of any exception. Records of exceptions shall be maintained.

5.3 Control of Nonconforming Product

(Note: Reference to or inclusion of a procedure addressing control of nonconforming conditions is required.)

The Company has a program to detect and correct nonconforming conditions relating to their product. This includes product provided by the Company or data, materials, sub-assemblies produced by others and incorporated into the product.

Nonconforming product will be identified to prevent unintended use or delivery. Corrected product will be subject to the same verification process as the original to demonstrate conformity to requirements.

The applicable procedure, listed in Appendix 6.1 of this Company QMS Manual, has been issued covering identification of nonconforming conditions, actions to

preclude use of nonconforming product, use of nonconforming product by concession, record keeping, and maintaining status until disposition.

The Customer shall be advised of any product nonconformance detected after it has been delivered or put into use, or as required by Contract.

The Contract Officer or Designated Responsible Officer is responsible to assure this notification is issued.

5.4 Analysis of Data

The Company collects and analyzes appropriate data to determine the suitability and effectiveness of its QMS and to identify where improvements can be made in the QMS.

The following data is gathered and analyzed:

- Customer satisfaction/dissatisfaction
- Conformity of product to requirements
- Measuring & monitoring data
- Trends of both positive and negative compliance
- Internal Quality Audit Data

5.5 Improvement

5.5.1 Continual Improvement

The Company facilitates continual improvement of the QMS by assessing and acting upon the following:

- Quality Policy changes
- Goal/objective changes
- Implementation of the results of management review
- Audit findings analysis of nonconformance
- Corrective and preventive actions implemented

5.5.2 Corrective Action

(Note: Reference to or inclusion of a documented procedure for corrective action is required.)

The Company has established a Corrective Action program to eliminate the cause of the nonconformity and thus prevent recurrence.

Corrective action will be appropriate to the severity of the nonconformity identified.

The applicable procedure, listed in Appendix 6.1 of this Company QMS Manual, addresses nonconformity identification (including customer complaints) cause determination, action to prevent recurrence, identifying and implementing the corrective action, recording results, determining if the corrective action was

implemented and effective in resolving the nonconformity.

5.5.3 Preventive Action

(Note: Reference or inclusion of a documented procedure for preventive action is required.)

The Company has a Preventive Action Program, which anticipates the potential causes of nonconformities and works to reduce or eliminate these potential causes.

The applicable procedure, listed in Appendix 6.1 of this Company QMS Manual, identifies potential nonconformities, their probable cause, determination of preventive action needed, and implementation of preventive action, determining if preventive action was implemented and effective in preventing nonconformity.

5.5.4 The COO or designee is responsible for assuring implementation of the QMS improvement requirements.

- END SECTION 5 -

SECTION 6 - APPENDICES

6.1 List of Company Quality Management System Implementing Procedures

6.2 Quality Policy

(Note: The Quality Policy should address such issues as:

- Company's commitment to satisfying Customers' needs means that there must be:
  - Free and effective communication with the Customer to achieve a clear understanding of environment into which the product will be applied
  - Elimination of nonconforming conditions
  - Production in adequate quantities
  - On time delivery
  - Timely and effective field service.
- A systematic management process must be applied to meet Customer needs.
- The Company's belief that the combination of
  - Adequately trained personnel
  - Working with documented procedures
  - Supported by adequately detailed product drawings and specifications,
  - Provided with the appropriate materials, facilities and tools
  - Is the basis for a system that will produce products and services meeting Customers' needs
- The Company's belief that management systems must be continuously examined and modified to ensure that it is effective in satisfying Customer needs in the midst of changes in business, regulatory, and social environments.
- That management systems must be sponsored and championed by the highest levels of the Company management in order to underline the priority the company places it.

6.3 Quality Objectives

6.4 Company Organization Chart

SECTION 01 45 29 - TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes the requirements for services provided by an independent testing laboratory employed by the Contractor.

1.2 SELECTION AND PAYMENT

A. Contractor shall employ on behalf of Metro-North and pay for services of an independent testing laboratory to perform specified inspection and testing.

B. Employment of an independent testing laboratory shall in no way relieve the Contractor of the obligation to perform the work in accordance with the requirements of the Contract Document).

C. Contractor shall submit the names and qualifications of three independent testing laboratories to the Engineer for approval not less than 15 days prior to the date of testing. The Metro-North Engineer will select one of the submitted testing laboratories, assuming it meets all guidelines and requirements.

1.3 SUBMITTALS

A. Prior to start of Work, submit testing laboratory names, addresses, and telephone numbers and names of full-time registered Engineers and responsible officers to Engineer for approval.

B. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory National Bureau of Standards during most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

C. In addition to the testing laboratory discussed in this Section, the Contractor shall submit, to the Engineer, lab credentials and certifications for laboratories providing analysis of medical surveillance testing, and analysis of personal air monitoring cassettes. Both the independent laboratory for inspection and testing and the medical surveillance testing laboratory must be accredited by OSHA as well as New York State Department of Labor (DOL), and the Department of Health (DOH), and hold any other appropriate licenses and certifications.

1.4 QUALITY ASSURANCE

A. Laboratory shall maintain a full-time Engineer registered in the State of New York on staff to review services.

B. Laboratory shall be certified as engineering testing laboratory to operate in the State of New York.

C. Testing equipment shall be calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards (NBS) standards or accepted values of natural physical constants.

1.5 LABORATORY RESPONSIBILITIES

A. Test samples of concrete and mortar mixes submitted by Contractor.

B. Perform on site cast in place testing of concrete, as per ACI and Section 03 30 00.

C. Provide test results of in plant concrete and asphalt mix testing, including concrete testing of pre-caster.

D. Perform and provide results of compaction testing of fill materials and subbase materials, and of asphalt compaction.

E. Provide qualified personnel at site after due notice; cooperate with Engineer and Contractor in performance of services.

F. Perform specified inspection, sampling, and testing of products and materials in accordance with these specifications.

G. Perform inspection of welds by non-destructive methods (Liquid Penetrant, Magnetic Particle) as directed by the Engineer.

H. Ascertain compliance of materials and mixes with requirements of Contract Documents.

I. Promptly notify Engineer and Contractor of observed irregularities or non- conformance of Work or products.

J. Perform additional inspections and tests as required by Engineer.

1.6 LABORATORY REPORTS

A. After each inspection and test, promptly submit two copies of laboratory report to Engineer and to Contractor, include: date issued, project title and number, name of inspector, date and time of sampling of inspection, identification of product and specifications section, location in the project, type of inspection or test, date of test, results of tests, and conformance with Contract Documents. When requested by Engineer, provide interpretation of test results.

1.7 LIMITS OF TESTING LABORATORIES AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the Work.

C. Laboratory may not assume any duties of Contractor.

D. Laboratory has no authority to stop work.

1.8 CONTRACTOR'S RESPONSIBILITIES:

A. Deliver to laboratory at designated location adequate samples of materials proposed to be used which require testing, together with proposed mix designs.

B. Cooperate with laboratory personnel, and provide access to work and to manufacturer's facilities.

C. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests inspections, and for storage and curing of test samples.

D. Notify Engineer and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and other Division 01 Specification Sections, apply to the Work of this Section.

1.2 RELATED SECTIONS

A. Section 01 33 00 - Submittal Procedures.

B. Section 01 74 19 - Construction Waste Management and Disposal.

C. Section 05 99 20 - Jacking Operations

D. Section 31 10 00 - Site Clearing.

E. Section 32 93 00 - Plants.

1.3 SUMMARY

A. This Section specifies:

1. Requirements for designing, furnishing, installing, operating, and removing temporary facilities and controls including:

a. Jacking Related Temporary Construction:

1) Temporary platform.

2) Temporary shoring.

3) Temporary barrier.

4) Temporary supports.

5) Temporary mats.

b. Temporary utilities:

1) Temporary electricity.

2) Temporary lighting.

3) Temporary telecommunications.

4) Temporary traffic Signals

c. Construction facilities:

1) Field offices and sheds.

2) First aid facilities.

3) Temporary sanitary facilities

d. Vehicular access and parking:

1) Haul routes.

2) Temporary parking areas.

3) Traffic control.

4) Staging areas.

e. Temporary barriers and enclosures:

1) Temporary barricades.

2) Temporary fencing.

3) Temporary protective walkways.

4) Temporary security barriers.

5) Temporary tree and plant protection.

f. Temporary controls:

1) Temporary erosion and sediment control.

2) Temporary pest control.

3) Temporary environmental controls.

4) Temporary storm water pollution control.

5) Site watering for dust control.

g. Project Identification:

1) Temporary Project Signage.

1.4 REFERENCES

A. Abbreviations and Acronyms:

1. ADA: Americans with Disabilities Act.

2. DSL: Digital subscriber line.

3. GPS: Geographic positioning system.

4. H.I.D.: High Intensity Discharge.

5. MUTCD: Manual on Uniform Traffic Control Devices for Streets and Highways.

6. NYSDEC: New York State Department of Environmental Conservation.

7. NYSDOT: New York State Department of Transportation.

8. OSHA: Occupational Safety and Health Administration.

9. SMS/MMS: Short Message Service/Multimedia Messaging Service.

10. SMO: Storm Water Management Officer.

11. SPDES: State Pollution Discharge Elimination System.

12. SWPPP: Storm Water Pollution Prevention Plan.

B. Reference Standards:

1. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE):

   a. ANSI/ASHRAE 62.1-2007 – Ventilation for Acceptable Indoor Air Quality.

   b. ANSI/ASHRAE/IESNA 90.1-2007 - Energy Standard for Buildings Except Low-Rise Residential Buildings.

2. American Society of State Highway and Transportation Officials (AASHTO):

   a. AASHTO M 80 - Coarse Aggregate for Portland Cement Concrete.

   b. AASHTO T 85 - Specific Gravity and Absorption of Course Aggregate.

3. American Society for Testing and Materials (ASTM):

   a. ASTM A 121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.

   b. ASTM A 392 - Standard Specification for Zinc-Coated Steel Chain- Link Fence Fabric.

   c. ASTM F 1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

d. ASTM D 3786 - Standard Test Method for Bursting Strength of Textile Fabrics - Diaphragm Bursting Strength Tester Method.

e. ASTM D 4355 - Standard Test Method for Deterioration of Geotextiles from Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.

f. ASTM D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

g. ASTM D 4632 - Standard Test Method for Grab Beaking Load and Elongation of Geotextiles.

h. ASTM D 4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.

i. ASTM D 4833 - Standard Test Method of Index Puncture Resistance of Geomembranes and Related Products.

4. Associated General Design Builders of America, Inc. (AGC):

a. Manual of Accident Prevention in Construction.

5. Council of Tree and Landscape Appraisers:

a. Guide for Plant Appraisal.

6. National Fire Protection Association (NFPA):

a. NFPA 10 – Standard for Portable Fire Extinguishers.

b. NFPA 70 – National Electrical Code® (NEC).

7. State of New York:

a. New York State Department of Environmental Conservation (NYSDEC):

1) State Pollution Discharge Elimination System (SPDES):

a) Permit No. GP-0-10-001 – SPDES General Permit for Stormwater Discharges from Construction Activity.

b) Permit No. GP-0-10-002 - SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s).

b. New York State Department of State:

1) Division of Code Enforcement and Administration, http://publicecodes.cyberregs.com/st/ny/st/index.htm:

a) Building Code of New York State.

b) Fire Code of New York State.

c) Mechanical Code of New York State.

c. New York State Department of Transportation (NYSDOT):

1) NYSDOT Standard Specifications (U.S. Customary Units).

2) New York State Standard Sheets (U.S. Customary Units).

3) New York State Supplement to the Manual on Uniform Traffic Control Devices for Streets and Highways (2009 Edition).

8. Tree Care Industry Association (TCIA)/American National Standards Institute (ANSI):

a. ANSI A300 (Part 1), Standards for Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Pruning).

b. NSI A300 (Part 2), Standards for Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Fertilization).

c. ANSI A300 (Part 3), Standards for Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Support Systems – Cabling, Bracing, and Guying Established Trees).

d. ANSI A300 (Part 4), Standards for Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Lightning Protection Systems).

e. ANSI A300 (Part 5), Standards for Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Management of Trees and Shrubs During Site Planning, Site Development, and Construction).

f. ANSI A300 (Part 6), Standards for Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Transplanting).

g. ANSI A300 (Part 7), Standards for Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Integrated Vegetation Management).

h. ANSI Z133.1, Safety Requirements for Arboriculture.

9. Underwriters Laboratories, Inc. (UL):

a. UL Online Certifications Directory, http://www.ul.com/regulators/quickguide.html.

10. United States Government:

a. Americans with Disabilities Act. (Pub. L. 101–336, 104 Stat. 327, 42 U.S.C. 12101–12213 and 47 U.S.C. 225 and 611) [ADA].

b. United States Code:

1) 33 U.S.C. Section 1251 et seq.

a) Water Quality Act of 1987, Public Law 100-4.

b) Clean Water Act of 1977, Public Law 95-217.

c) Federal Water Pollution Control Act Amendments of 1972, Public Law 95-500.

c. Department of Justice:

1) 2010 ADA Standards for Accessible Design,

2) 28 CFR 35 – Nondiscrimination on the Basis of Disability in State and Local Government Services

3) 28 CFR 36 – Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities.

d. Environmental Protection Agency (EPA):

1) 40 CFR 123 and 124 – National Pollutant Discharge Elimination System Permit Application Regulations for Storm Water Discharges; Final Rule.

2) 40 CFR 9, 122, 123, and 124 – National Pollutant Discharge Elimination System – Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges; Final Rule

3) 40 CFR 61 National Emission Standards for Hazardous Air Pollutants.

e. Federal Highway Administration (FHWA):

1) Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD).

f. Occupational Safety and Health Administration (OSHA):

1) 29 CFR 1910 Occupational Health and Safety Standards.

2) 29 CFR 1926 Safety and Health Regulations for Construction.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Notices:

a. Not less than 20 work days before closing each street, notify the Construction Manager in writing of the closing.

b. Not less than 14 days before prohibiting, stopping, and parking vehicles is required or work is to be performed on City streets, notify Westchester County Transportation Engineer or local jurisdiction in writing; and submit a copy of each notice to the

Construction Manager for information.

c. Not less than 7 days before impairing access to buildings adjacent to the station sites and use of public ways thereto, notify individual owners, owners' agents, and tenants of in writing; and submit a copy of each notice to the Construction Manager for information.

1.6 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

1. Town Village of Scarsdale – as required

2. Town of Greenburgh – as required

3. Westchester County - as required

4. State of New York:

a. Comply with the applicable rules, regulations, and programs of the New York State Department of Environmental Conservation (NYSDEC), particularly the following:

1) State Pollution Discharge Elimination System (SPDES).

a) Permit No. GP-0-10-001 - SPDES General Permit for Stormwater Discharges from Construction Activity.

b) Permit No. GP-0-10-002 - SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s).

2) Obtain the necessary permits from the New York State Department of Environmental Conservation (NYSDEC) to construct the Work of this Contract.

a) Abide by the Metro-North prepared Stormwater Pollution Prevention Plan (SWPPP).

b) Do not start the work until the proposed erosion and sedimentation control plan has been approved by NYSDEC, and a permit for construction has been issued.

3) Comply with the requirements specified in the State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity, which governs the Work of this Section and prohibits the discharge to the waters of the State of any pollution materials whether from industrial or domestic sources.

4) Pay any fines assessed to the Contractor for violation of the regulatory rules, regulations, and programs at no increase in Contract Price.

5) Comply with the applicable rules, regulations, and programs of the New York

State Department of Transportation (NYSDOT).

B. Certifications:

1. Geotextile Certificates of Compliance:

a. For each proposed geotextile material, submit certificates demonstrating that the material conforms to the requirements of this Specification.

1.7 SUBMITTALS

A. Action Submittals:

1. Within 10 working days after the date of Award, a layout of construction plant, showing locations of fences, roadways, buildings or sheds, field offices, Metro-North's field office (including interior layout), temporary utility services, and storage and lay down areas.

2. Submit the following to the Construction Manager for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures and 05 99 20 Jacking Operations:

a. Engineering:

1) Engineered designs, drawings, calculations, and other documents for Falsework, forms, formwork, shoring, temporary protective devices, temporary bracing, jacking and lifting operations, and all other Temporary Construction Work and/or Facilities, as required, and/or as indicated on the Contract Drawings to be approved by Metro-North and the Engineer. Design calculations shall be prepared, signed, and sealed by a Professional Engineer licensed in the State of New York.

b. Product Data:

1) Products furnished for the Work of this Section.

2) List of pesticide, fungicide, and anti-desiccant materials, and application methods and documents proposed for use.

c. Shop Drawings:

1) Working Drawings showing the proposed temporary erosion and sediment controls.

2) Locations and details of protective fencing.

3) Temporary project signage message and layout.

d. Samples:

1) Geotextile fabric Samples.

e. Certificates:

1) Geotextile material certification.

f. Delegated Design Submittals:

1) Site Layout Plan.

2) Tree Protection Fencing Plan.

3) Evacuation Plan.

4) List of Emergency Contacts.

5) Traffic Control Plans (TCP) and updates.

6) Individual Lane and Sidewalk Closure Plans.

7) Tree Protection Fencing Plan.

8) Temporary Erosion and Water Pollution Control Plan.

9) Proposed field office layout.

B. Closeout Submittals:

1. Submit the following to the Construction Manager in accordance with the requirements of Metro-North:

a. Warranty Documentation:

1) Plant Warranty.

2) Temporary Tree and Plant Protection Warranty.

1.8 WARRANTY

A. Special Warranty:

1. Furnish and submit a 90-day Temporary Tree and Plant Protection Warranty on the workmanship and materials provided under this Section to the Construction Manager.

B. Extended Correction Period:

1. Furnish and submit an unconditional 2-year Plant Warranty for all plants repaired or replaced as required under this Section to the Engineer.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. Regulatory Requirements:

1. Comply with the Laws, Codes, and Regulations pertaining to the work being performed at each station site.

2. United States Government:

a. All work is governed at all times by the applicable provisions of Federal Laws, including but not limited to, the following:

1) Americans with Disabilities Act.

2) Water Quality Act of 1987.

3) Clean Water Act of 1977.

4) Federal Water Pollution Control Act Amendments of 1972.

b. Comply with the applicable regulations of the Occupational Safety and Health Administration (OSHA).

3. State of New York:

a. Comply with the applicable requirements of the New York State Department of Environmental Conservation (NYSDEC).

b. Comply with the applicable requirements of the New York State Department of Transportation (NYSDOT).

c. Comply with the applicable requirements of the Building Code of New York State.

d. Comply with the applicable requirements of the Fire Code of New York State.

e. Comply with the applicable requirements of the Mechanical Code of New York State.

4. Town Village of Scarsdale and Town of Greenburgh, NY:

a. Comply with the requirements specified in each municipality's various Code of Ordinances.

5. National Fire Protection Association (NFPA):

a. Comply with the safety provisions of the Uniform Code, NFPA 241, and Metro-North Safety Ryles pertaining to the Work and, particularly, in connection with any cutting or welding performed as part of the Work.

2.2 MATERIALS

A. Submit Product Data for the Products furnished for the Work of this Section to the Construction Manager for approval prior to their use.

B. Burlap:

1. Provide untreated burlap fabric.

C. Protective Fencing:

1. Fence Fabric:

a. Provide clean, new, and unblemished fence fabric with the following characteristics:

1) Height: 4 feet.

2) Material: Orange plastic fabric mesh.

b. Provide fence fabric in 50 feet long, minimum, continuous sections.

c. Provide the same type mesh fence fabric throughout the duration of the Contract.

d. Manufacturers:

1) Industrial Fabrics, Inc., HiVu® Barrier Fence, www.ind-fab.com.

2) Propex Fabrics, Inc., www.propexinc.com.

3) Tensar International, www.tensarcorp.com.

4) Approved equal.

2. Fence Posts:

a. Provide fence posts having the following characteristics:

1) Post Material: Painted lightweight steel (0.98 pounds per foot).

2) Type: Domestic tee stud with a metal flange at the bottom.

3) Length: 6 feet.

3. Fence Fabric Ties:

a. Provide ties consisting of 16 gage galvanized steel wire.

D. Heavy Duty Protective Fencing:

1. Provide heavy duty protective fencing.

a. Heavy duty protective fencing may include, but is not limited to, temporary chain link type fence, 6 feet high with precast concrete bases.

E. Pesticide, Fungicide, and Anti-Desiccant:

1. Provide materials approved by the governing regulatory agencies that are suitable for the

identified needs.

2. Submit a list of pesticide, fungicide, and anti-desiccant materials proposed for use, and their application methods and documentation.

F. Topsoil:

1. Provide backfill as specified in Section 32 93 00, Plants, for backfill around plants as needed.

G. Silt Barrier Fence:

1. Geotextile Fabric:

a. Provide woven or non-woven fabric consisting of long chain, polymeric filaments or yarns, such as polypropylene, polyethylene, polyester, polyamide, or polyvinyledene-chloride, formed into a stable network so the filaments or yarns retain their relative position to each other.

b. Provide fabrics inert to commonly encountered construction chemicals or substances, and having at a minimum the physical requirements specified in Table 01 50 00-1 for each property when tested according to the test method listed for the property.

Table 01 50 00-1 Physical Properties of Geotextile

Properties	Test Method	Minimum Requirements
Grab Tensile Strength, Pounds.	ASTM D 4632	90
Grab Tensile Elongation, Percent	ASTM D 4632	15, minimum
Burst Strength, psi	ASTM D 3786	140
Puncture, lbs, (5/16 Inch Flat-End Rod)	ASTM D 4833	40
Trapezoid Tear Strength, Pounds	ASTM D 4533	30
Apparent Opening Size, Sieve Number	ASTM D 4751	Number 20, maximum
Ultraviolet Resistance Strength Retention, 0/0	ASTM D 4355	70 at 150

1) Wire Mesh Support:

c. Provide either galvanized or aluminized, 14.5 gauge wire mesh arranged in a maximum grid of 6 inches by 6 inches.

d. Alternatively, an acceptable, equivalent plastic mesh may be used.

2. Posts:

a. Provide 2-inch, minimum, square wood posts; 1-1/4 inch by 1 inch steel T-sections or equivalent; or acceptable plastic posts with an equivalent section.

3. Fasteners:

a. Provide either 1 1/2-inch long Number 9 staples, or 17 gauge galvanized or aluminized steel tie wires of the appropriate length.

H. Hay Bales:

1. Provide seed-free hay bales approximately 36 inches long by 26 inches wide by 18 inches high, and bound with galvanized wire or nylon rope tied across the stem length.

I. Construction Entrances and Sediment Traps:

1. Aggregate:

a. Provide coarse aggregate conforming to the requirements for Size Number 1 as specified in AASHTO M 80.

J. Utility Materials:

1. Provide such materials as may be required for providing the temporary utility services specified herein.

K. Temporary Traffic Control Devices:

1. Furnish temporary traffic control devices that comply with the requirements specified in the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) and the New York State Supplement to the Manual on Uniform Traffic Control Devices for Streets and Highways (2009 Edition).

2. Temporary Concrete Barriers:

a. Furnish precast “Jersey Barrier” sections.

1) Concrete: 3,000 psi.

b. Provide 1/2” joint opening between adjoining precast sections

3. High Rise Warning Flag Unit:

a. Furnish high rise warning flag unit having 3 flags mounted 9 feet above the base.

4. Warning Lights and Flares:

a. Furnish warning lights and flares capable of alerting approaching traffic to hazards, unsafe conditions, and variances to normal traffic patterns.

5. Signs:

   a. Furnish signs as indicated on the Contract Drawings, in the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), and in the referenced NYSDOT Publications.

6. Flagmen signs:

   a. Furnish flagmen signs that are 24 inches across, octagonal in shape, and attached to a five-foot handle.

   b. Furnish flagmen signs that have a stop sign on one side, and a slow sign on the other side.

      1) Stop Signs:

         a) Provide stop signs having white reflectorized letters not shorter than 8 inches that spell “STOP” on a reflectorized, red, octagonal background.

      2) Slow Sign:

         a) Provide slow signs having black letters not shorter than 8 inches that spell “SLOW” on a reflectorized, orange, diamond background.

         b) Paint the area between the diamond and the edge of the flagmen sign black.

7. Pavement Marking Paint:

   a. Provide temporary pavement marking complying with the requirements specified in Section 32 17 23, Pavement Markings.

L. Other Materials:

1. Provide other materials as required and approved by the Construction Manager.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Review the existing conditions at the Site, and determine what else is necessary for the prevention of water pollution due to erosion.

2. Prior to the start of construction, conduct on-site inspections of plants and vegetation with the Project Arborist, and identify and inventory the plants and vegetation that are to remain in place during this area tour.

   a. Field measure and stake Project improvements as needed for establishing the

location of protective fencing.

b. In areas where the protective fencing will be located at a fixed distance from proposed Project improvements, field survey and stake improvement sites prior to the area tour with the Project Arborist.

B. Evaluation and Assessment:

1. In addition to performing the work described herein and indicated on the Contract Drawings, implement the additional measures determined necessary for the prevention of water pollution due to erosion discovered during the review of the Work Site.

3.2 PREPARATION

A. Protection of In-Place Conditions:

1. Existing Surfaces and Facilities:

a. Take positive action to protect all existing surfaces and facilities from any damage resulting from construction operations unless modifications to the surfaces or facilities are required as part of the Contract.

b. Protect all paving, landscaping, and utility facilities from damage caused by mobile and stationary equipment, including vehicles delivering materials to the site.

B. Surface Preparation:

1. Clear Existing Vegetation:

a. In accordance with the requirements of Section 31 10 00, Site Clearing, clear and remove existing vegetation as required to install preliminary location stakes and to install fence posts and fence fabric for protecting tree and plant materials.

1) Keep clearing operations to the minimum needed for fence installation.

2) Do not clear tree and plant materials from within the area to be protected by the fence.

3) Perform clearing in a manner and to an extent approved by the Construction Manager.

b. Remove dead and damaged plants that the Project Arborists determine are a hazard or that are incapable of restoration.

C. Demolition / Removal:

1. Perform demolition and construction activities within protected areas in a manner that minimizes damage to tree roots and branches.

a. Use hand tools where necessary.

b. Make minimal use of construction equipment within the protected areas.

1) Use such equipment within the protected area only when approved by Metro-North and local committees, and after consultation with local zoning and landscape ordinances.

2) Provide 72 hours advanced notification prior to the use of the equipment within the protected areas.

3) Provide bridging materials, such as protective planking, in protected areas where such construction equipment operates.

c. When utilities must be installed within protected areas, bore under the protected areas whenever possible instead of digging open trenches through them.

3.3 TEMPORARY UTILITIES

A. Provide and pay for all temporary utilities required for this Contract including electrical power; traffic signal, and lighting; and if required, water, drainage and fire protection.

1. Include obtaining permits, providing the utility services, and connecting and disconnecting the utilities in the costs.

2. Unless otherwise specified, do not use Metro-North utilities.

B. Temporary Electricity:

1. Provide and maintain suitable temporary electrical systems and power facilities required for the proper performance of the Work until final completion and acceptance of the Work.

a. Provide UL-listed electrical equipment and wiring for temporary electricity.

b. Install temporary electricity in accordance with the requirements specified in NFPA 70 and of the Occupational Safety and Health Administration (OSHA)

2. Provide power service from temporary electric feeders from the local utility, from engine generators, or from the Owner's existing power service, provided Metro-North has granted advance permission.

a. If using the Owner's existing power service, do not disrupt Owner's need for continuous service, take measures to conserve energy, and provide separate metering and reimburse the Owner for the cost of energy used.

b. Complement existing power service capacity and characteristics as required.

3. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required.

a. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1) Provide 20 Ampere duplex outlets, single phase circuits for power tools for every 500 square feet of active work area.

2) Provide 20 Ampere, single phase branch circuits for lighting.

3) Permanent convenience receptacles may not be used during construction.

b. Provide flexible power cords as required.

4. Provide a main service disconnect and over-current protection at a convenient location, and meter.

C. Temporary Lighting:

1. Provide and maintain lighting for the field offices that achieves a minimum uniform lighting level of 100 foot-candles at desk height in all areas within the offices.

2. Provide and maintain lighting for construction operations in accordance with the requirements specified in 29 CFR 1926.56, and that achieves a minimum lighting level of 2 Watts per square foot or 10 foot-candles.

a. Provide UL-listed electrical equipment and wiring for temporary lighting.

3. Security Lighting:

a. For exterior staging and storage areas, provide and maintain lighting for security after dark in accordance with the requirements specified in 29 CFR 1926.56, and having a minimum lighting level of 1 Watt per square foot.

b. Provide and maintain HID lighting having a minimum lighting level of

c. 0.25 Watt per square foot for interior work areas after dark.

4. Position and aim lighting equipment so it will not shine directly on passing trains, vehicular traffic, or commercial or residential premises adjoining the Site.

5. Provide branch wiring from a power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

a. Provide UL-listed electrical equipment and wiring for temporary lighting.

6. Comply with the requirements of ANSI/ASHRAE/IESNA 90.1-2007.

7. Permanent lighting may be used during construction.

a. The Metro-North will meter usage for payment by the Contractor.

8. Maintain the lighting and provide routine repairs.

D. Other Temporary Utility Services:

1. Determine the need for other temporary services as may be required to prosecute the Work,

and make arrangements with utility companies and municipal agencies for such service.

3.4 CONSTRUCTION FACILITIES

A. Site Layout Plan:

1. No later than 10 Days after the effective date of the award, prepare a proposed Site Layout Plan.

   a. Include Working Drawings showing at a minimum the location of construction fences; roadways and entrances; locations and sizes of all field offices, shops, buildings, and sheds; locations and sizes of all staging, storage, and lay down areas; waste and recycling containers, security fencing, stationary equipment, temporary utilities, and similar facilities.

   b. The location of stationary equipment and the location of miscellaneous mobile equipment are subject to approval.

2. Within the 20 Days after receipt of the Notice-To-Proceed, submit the Site Layout Plan to the Construction Manager for approval.

B. Field Office

1. The Metro-North Office shall be comprised of one approved weatherproof building for offices/ conference room at the site. The structure shall have a minimum ceiling height of 7 feet and shall be provided with weatherproof doors and windows. Each window shall have a minimum area of 8 square feet and be of a type that will open and close to provide adequate ventilation. All windows shall have window shade/ mini blinds as directed by the Engineer. The structure shall be fully skirted with vinyl or aluminum siding, or painted plywood as agreed upon by the Engineer.

2. Field office shall meet the requirements of local building codes. A certificate of Occupancy (CO) shall be required for all locations. In order to obtain a CO, the offices must have smoke detectors, pull stations, horn strobes and a fire alarm panel installed. There shall be battery back up Emergency Exit signs at each egress point. A dialer shall be programmed with the phone numbers of the central alarm company, MTA Police, Metro-North RTC in Grand Central Terminal and the local Fire Department or fire dispatch.

3. The office shall provide a minimum 670 square feet of floor space with a minimum of two outside doors and eight windows. Security screens shall be placed on windows and locks and security bars shall be placed on access doors, unless otherwise directed by the Engineer. The trailer shall be partitioned to provide three rooms with adjoining doors. The smaller spaces on each end of the trailer shall be not less than 200 square feet in net floor area and shall contain two of the six windows and one office shall contain one of the outside doors. Suitable hard surfaced walkways shall be provided from the Engineer's office and the parking locations.

4. Parking Spaces: The Contractor shall provide Metro-North with 8 parking spaces

(including snow removal and maintenance) adjacent to the field office location.

5. Telephone: Provide telephone service consisting of four lines, two general use telephone lines, one dedicated Metro-North telephone line (on the Metro-North system if available), and one fax line. The Contractor shall supply 4 phones for the exclusive use of Metro-North. The phones shall have modular jacks (as directed by the Engineer) at the wall and phone and be adaptable to electronic communications. The phones shall be configured for two line operation with speaker phone. One phone shall be a single line phone for use on the dedicated Metro-North line and another phone line shall be used for the fax machine. Phones shall be installed at locations as directed by the Engineer. Two two-line phones shall be equipped with a 25 foot cord. The Contractor shall also supply a DSL or high speed cable modem connection.

6. E-Mail Address: The Contractor shall maintain an e-mail address for correspondence use during the construction period.

7. Requirements and furnishings shall be as follows and shall be in a condition satisfactory to Engineer:

    a. Lighting: Electric light, non-glare type luminaries to provide a minimum illumination level of 100 foot-candles at desk height.

    b. Heating and Air Conditioning: Maintain an ambient air temperature of 70° F ± 5°.

    c. Potable Water: From bottled water with refrigerator unit; hot/cold water.

    d. Refrigerator: One 2.4 cu. ft. cold storage capacity, cycle defrosting, full range thermostat dial control refrigerator.

    e. Microwave: 2.0 cu. ft. Countertop Microwave with Sensor Cooking Controls.

    f. Fire Resistant Cabinet: Four drawer, legal size file cabinet with lock and two keys, meeting the requirements for "Insulating Filing Devices, Class 350-1 Hour (D)" of ANSI/UL 72 or the Class D rating of the original Underwriters Laboratories specification for insulated filing devices. One shall be provided.

    g. First Aid Kit: Keep the kit properly stocked with appropriate first aid supplies at all times. First Aid Kit shall be Johnson & Johnson® 158 Piece Professional/Office First Aid Kit for 25 People, Plastic Case.

    h. Toilet: A separately enclosed room, properly ventilated and complying with applicable sanitary codes. The Contractor shall provide all lavatory amenities, necessary paper and soap products, hot and cold running water and a flush-type toilet. The Contractor shall replenish the supplies as required.

    i. Maintenance: The Contractor shall maintain all facilities and furnished equipment in good working condition for the duration of the Contract. The

office shall be cleaned weekly (min.) or as required by the Engineer.

j. Locker or closet: Metal or wood locker with lock of sufficient size for storage of surveying instruments and testing equipment.

k. Fire Extinguisher: Non-toxic dry chemical, meeting Underwriters Laboratories, Inc., approval for Class A, Class B and Class C fires with a minimum rating of 2A:10B:10C. One 10 lb. extinguisher per room for all locations.

l. Pencil Sharpener: Electric pencil sharpener. X-ACTO Powerhouse 1792 Electric Pencil Sharpener

m. Photocopy Multi-Function Color Office Machine (Copy, Print, Scan, Fax): One Ricoh Aficio MP C2051or approved equal with the following features:

1) Color Printing

2) Collating

3) Stapling

4) Enlargements to 400%

5) 8 ½" x 11" paper

6) 8 ½" x 14" paper

7) 11" x 17" paper

8) Two-sided option

9) Scan

10) Fax

11) Print

12) Hot Spot enabled

The Multi-Function Office Machine shall be networked to the field office computer network for all features listed above.

n. A minimum of two week supply of fax/ copy paper (all sizes – letter, legal, ledger), staple cartridges and toner cartridges shall be provided and replenish as requested.

o. Dry Erase Board: Three wall mounted dry erase boards. 3' wide x 2' tall. Three sets multi color (black, blue, red, green) dry erase markers.

p. Post Office Box: A post office box shall be provided at the nearest U.S.

Post Office as directed by the Engineer.

q. Telephone Answering Machine: FCC approved automatic answering device capable of recording outgoing messages of 60 seconds long and receiving a minimum of 40 incoming messages of 60 seconds duration. The unit shall include a message mark to permit review of new messages without erasing old messages. The unit shall include remote programming of playback, backspace, and out-going message re-record. The unit shall include computer-generated voice marking time and day of each message received. The unit shall allow for the retrieval of messages without a remote beeper unit.

r. Ergonomic Chair: Three each with arms, five legs with casters and adjustable from approximately 17" to 23" height by pneumatic gas cylinder. Chair shall be fully assembled. Staples Vocazo Mesh Manager's Chair, Black.

s. Computer System: Provide two laptop computers - The computers shall consist of the following minimum requirements:

Laptop Computers: HP Spectre x360 Laptop - 13t touch or approved equal (shall be returned to the Contractor at Project Close-Out):

Processor	8th Generation Intel® Core™ i7 processor
Operating System	Windows® 10 Professional, 64Bit, English
Display	13.3" diagonal Full HD touch display
Memory	16GB
Hard Drive	500GB
Optical Drive	External Tray load DVD Drive (Reads and Writes to DVD/CD)
Battery	4-cell, 61 Wh Li-ion
Mouse	Dell 2 Button Scroll Optical Wireless USB Mouse
Surge Protector	TrippLite Notebook Surge Protector
Bag	Laptop bag, 3 pockets/ compartments.
Internet Device	Provide a 4G LTE wireless internet device and maintain mobile wireless service for each laptop computer

Provide Compatible Docking Station and 24" Monitor for each Laptop.

Docking Station:

t. The above computers and printer equipment shall include all cables and software. All equipment shall be set up as a Wireless Local Area Network with access to the Internet utilizing a DSL high speed or cable connection for the duration of the Contract.

u. Computer Software: All computer software indicated below shall be loaded into the computers with manuals and original disks for use by Metro-North. Software shall be new and unused. Software required shall include the following:

1) Microsoft Windows XP Professional.

2) Norton Anti-Virus Protection – latest updates (maintained for entire project duration).

3) MS Office Professional 2013 (or latest edition).

4) Microsoft Internet Explorer (or approved browser with e-mail).

5) Primavera Project Planner (Software to be compatible with Project Schedule format).

6) Adobe Acrobat XI (or latest edition)

v. Portable Hard Drive – One "Seagate FreeAgent GoFlex Pro Ultra-portable Drive" (Model STAD750102/USB3.0/750GB). Each portable hard drive shall include all cables, docking station, software and FreeAgent Portable Case (Model STAF106). The portable hard drive and all accessories will remain the property of Metro-North at Project Close-Out.

w. Camera: One "Olympus Stylus Tough-TG-830iHS" Digital Camera or approved equal. One multimedia storage card - minimum capacity 2GB. The Camera and all accessories will remain the property of Metro-North at Project Close-Out.

x. Television/DVD: Furnish a 27" television/DVD on site for Metro-North's safety training of the Contractor's employees.

y. Evacuation Plan – Contractor shall post an evacuation plan including muster point.

z. List of emergency phone numbers.

aa. Furnishings:

1) 4 Office Desks with Drawers and Locks not less than 2.5’ x 5.0’ each. HON® Metro Classic 60" Double Pedestal Desk, Charcoal/Gray

2) 1 Drafting Tables, 3.0’ x 6.0’, supported by wall brackets and legs. Capable of supporting 200 pounds.

3) 1 Draftsman’s Stool, HON® Comfortask® Fabric Task/Swivel Stool, Black

4) 4 Waste Paper Baskets, 10-gallon capacity

5) 1 Vertical Filing Plan Rack for 12 sets of plans each (mobile)

6) 2 Three-Shelf Bookshelves, approximately 3’ x 4’

7) 1 Office Tables, not less than 3.0’ x 6.0’

8) 1 Metal Storage Cabinet, with four adjustable shelves, tumbler lock and two keys (approximately 72” high, 36” wide, 18” deep)

9) Conference tables (folding) as required for 10 people and 10 chairs (folding/ padded) located in the trailer.

bb. Measuring Wheel. Rolatape 32-400 Professional Series 4-Foot Measuring Wheel.

cc. 4’ Long Carpenter’s Level.

dd. Min-Max Thermometer – Sper Scientific 736680

C. First Aid Facilities:

1. Identify local medical facilities serving the area of the Project, and post directions to their locations and their contact information in the field office.

2. Provide a first aid kit kept in the field office and stocked with appropriate first aid supplies at all times, first aid kit should include trauma kit and quikclot, or equivalent

D. Temporary Sanitary Facilities:

1. Provide temporary sanitary facilities at the Site in accordance with the requirements specified in 29 CFR 1926.51.

3.5 VEHICULAR ACCESS AND PARKING

A. Haul Routes:

1. Restrict construction vehicular traffic to the approved haul route.

2. Failure to comply with the haul route plan may make violators subject to legal action by governmental agencies, and where direct or indirect damage is done to public or private property will make the Contractor responsible to clean-up and repair the damage.

B. Temporary Parking Areas:

1. Grade the parking areas for drainage, and surface them with crushed stone if they are not already improved.

2. Provide 4 parking spaces directly adjacent to the Metro-North project trailer for use by Metro-North.

a. Keep the spaces clear of snow similar to the trailer requirements.

b. Do not park Contractor vehicles in the spaces, store materials in the spaces, or otherwise make these parking spaces inaccessible for use by Metro-North.

C. Traffic Control:

1. Prior to submitting the bid for this Contract, contact the various municipalities holding jurisdiction of each of the stations to determine their traffic control requirements.

2. Furnish, install, maintain, and subsequently remove temporary traffic control devices and temporary traffic striping and markings; furnish flagmen; control, warn, guide, and protect vehicular and pedestrian traffic on streets and sidewalks affected by construction of the Contract, and that adjacent to the worksite; ensure unimpeded access to building, adjacent to the worksite; close portions of streets and sidewalks and prohibit vehicles from stopping and parking of on streets adjacent to the Site.

a. Ensure that construction operations will not impede vehicular and pedestrian traffic to the extent that public safety will be threatened and passage of emergency vehicles will be restricted.

b. Do not obstruct public ways, including streets, sidewalks, and accesses to public and private properties and bus stops.

c. Do not reduce carrying capacity, except as indicated on reviewed and accepted Traffic Control Plans (TCP) specified herein.

d. Maintain pavement surfaces in a smooth riding plane where vehicular and pedestrian traffic is routed.

e. In excavated paved areas, backfill excavations and install temporary pavement immediately after the backfill has been placed.

1) Restore each section of permanent pavement and sidewalk as soon as is practicable after completion of the Work for which that section of pavement and sidewalk is removed.

f. Maintain existing traffic signal operation in continuous operation.

g. Prevent pedestrian access to the Site using devices such as fences, barricades, and

flagging and security personnel.

h. During working hours, prevent vehicles from stopping and parking on streets adjacent to the portions of the Site where construction is being performed.

1) Erect "NO PARKING" and "NO STOPPING" signs at intervals of not more than 50 feet along public streets adjacent to the Project, and include messages giving times and days of no parking and no stopping.

a) Cardboard signs will not be permitted.

b) Remove the signs at the end of the posted time limit.

c) If additional work is required beyond the posted dates, change the signs to reflect the new dates and times.

d) If for any reason the Work will not be performed as stated, change the dates and/or times on posted signs in a timely manner, and notify the various municipalities individual Traffic Departments and local police.

2) If vehicles are parked within the posted restrictive area, have the vehicle removed and relocated to a place of non-interference with the construction work.

a) Provide licensed tow truck drivers to remove illegally parked, abandoned, or disabled vehicles.

(1) Supervise and coordinate the tow truck operations.

b) Direct the tow truck driver to make and keep a list of all relocated vehicles showing the following information, and submit a written copy of the above information to the various municipality Traffic Departments for use in the vehicle retrieval process and to the Construction Manager for information:

(1) Vehicle license number.

(2) Vehicle make and color.

(3) Location vehicle was parked.

(4) Location vehicle was relocated to.

c) The Contractor and/or the owner/operator of the licensed tow truck must agree to indemnify, defend, and hold harmless the various local municipalities and all of its officers and subordinates from all suits and actions as a result of towing any vehicles.

3. Traffic Control Plans (TCP):

a. Prepare a Traffic Control Plan (TCP) indicating proposed traffic control devices in accordance with the following:

1) NYSDOT Standard Specifications (U.S. Customary Units).

2) New York State Standard Sheets (U.S. Customary Units).

3) Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)

4) New York State Supplement to the Manual on Uniform Traffic Control Devices for Streets and Highways (2009 Edition).

b. In the Traffic Control Plan (TCP), show and describe proposed locations and time durations of the following:

1) Pedestrian and public vehicular traffic routing.

2) Traffic blockage and lane reductions anticipated to be caused by construction operations.

3) Allowable on-street parking within the immediate vicinity of worksite.

4) Access to the building immediately adjacent to worksite.

5) Driveways which will, and those which will not, be blocked by construction operations.

6) Temporary traffic control devices required on streets and sidewalks affected by construction.

7) Temporary commercial and industrial loading and unloading zones.

8) Modifications to street light locations and operation.

9) Modifications to traffic signal locations and operation.

10) Proposed haul routes.

c. Within 15 days of Notice to Proceed and before starting the Work, submit the Traffic Control Plan (TCP) to the various municipality Traffic Department of each station for approval, and as an application for permits to work in the public right-of-way; and submit another copy to the Construction Manager for information.

1) Costs, direct or indirect, not reflected in the bid, resulting from failure to reasonably anticipate such costs, will not be considered for payment.

d. Every time it becomes necessary to modify traffic operations or undertake a construction activity which creates a different traffic impact, prepare and submit an updated Traffic Control Plan (TCP) to the various municipality Traffic Department for approval; and submit another copy to the Construction Manager for information.

4. Street Closing Plans:

a. All streets adjacent to each station must remain operational at all times. No full

street closures will be allowed.

5. Individual Lane and Sidewalk Closure Plans:

   a. Prepare an Individual Lane and Sidewalk Closure Plan indicating proposed traffic control devices that shows and describes the proposed location, hours and time duration of the closure, vehicular and pedestrian traffic routing and management, traffic control devices for implementing pedestrian and vehicular movement around the affected closure, dates the closure will start and be reopened, and details of barricades and protecting closure.

   b. Not less than 15 work days before the actual lane and sidewalk closing, submit the Individual Lane and Sidewalk Closure Plan to the various municipality Transportation Engineer for approval; and submit another copy to the Construction Manager for information.

   c. Only close streets and sidewalks in accordance with the Individual Lane and Sidewalk Closure Plan.

   d. Install sidewalk closure signs in an advanced location of the closed portion of the sidewalk in order to permit safe crossing of the street at a crosswalk.

6. Temporary Traffic Control Devices:

   a. Before diverting traffic, post temporary traffic control devices along traveled ways where construction activities occur where indicated on the approved Traffic Control Plan (TCP).

   b. Place and maintain temporary traffic control devices throughout the construction period in those locations which will enable traffic to enter, traverse, and leave project area without hazard, and without abrupt and unwarranted changes in direction.

      1) Place drums as indicated.

      2) Place cones on not more than 25-foot centers.

      3) Modify temporary traffic control devices as shown on updated plans, and remove them as soon as construction activities have been completed.

   c. Warning Lights:

      1) If approaching traffic needs to be alerted to hazards, unsafe conditions, and variances to normal traffic patterns; place warning lights and operate them between sunset and sunrise.

   d. Warning Flag Units:

      1) Where motorists' visibility of existing and temporary warning devices, traffic signals, and pedestrian crosswalks will either be limited or obscured, place and maintain high-rise warning flag units.

   e. Barricades and Cones:

1) If personnel and equipment will be working within 5 feet of the edge of a traffic lane which will be bearing traffic, place and maintain barricades, cones, and similar protective devices.

7. Traffic Signs:

a. Support and protect traffic signs, including street name signs, bus stop signs, regulatory, and directional signs, unless otherwise shown on the Contract Drawings.

1) Repair or replace traffic signs damaged by construction operations or as directed by the Construction Manager.

b. Where removal of traffic signs is required during construction, remove, store, and ultimately reinstall signs using hardware approved by the appropriate agency.

8. Construction Signs:

a. As required and directed by the Construction Manager, furnish, erect, move, and remove construction signs to adequately and safely inform and direct motorists and to satisfy legal requirements.

b. Keep construction signs clean, mounted at the required height on adequate supports, and placed in proper position and alignment so maximum visibility is provided both night and day.

1) Paint wood supports and the backs of plywood sign panels with 2 coats of white paint.

2) Furnish signs and markers that indicate actual existing conditions, and move, remove, relocate, or change them immediately as directed by the Construction Manager.

c. Mount construction signs in accordance with the referenced codes and standards.

1) Mount signs at least 5 feet high.

2) Under special conditions, signs may be mounted at a greater height to fit the situation on an approved TCP submission, or as directed by the Construction Manager.

d. All signs are the property of the Contractor, must be maintained in good condition for the duration of the Contract, and must be removed from the Site when the Contract is accepted.

e. Place the name of the Contractor someplace on the sign only for the purpose of identifying the sign's owner.

9. Flagmen:

a. Where opposing vehicular traffic must be diverted onto single traffic lanes, where traffic must change lanes abruptly, where construction equipment either enters or crosses traffic lanes and sidewalks, where construction equipment may

intermittently encroach on traffic lanes and unprotected sidewalks and crosswalks, where construction operations would affect public safety and convenience, and where traffic regulation is needed because of the rerouting of vehicles around the worksite, furnish flagmen having flagman signs.

D. Staging Areas:

1. Provide staging areas for staging the materials and equipment not immediately required for the Work.

2. Grade the staging areas for drainage, and surface them with crushed stone if they are not already improved.

3.6 TEMPORARY BARRIERS AND ENCLOSURES

A. Temporary Barricades:

1. Provide temporary barriers and enclosures to protect existing facilities and adjacent properties from damage from construction operations.

2. Provide barricades required by governing authorities for public rights-of-way.

3. Always allow continued access for Metro-North patrons and its employees to access to and from each station platform during construction activities.

B. Temporary Fencing:

1. Where indicated, completely encircle the work areas on the Site with temporary fencing, and leave no gaps in the fence panels.

a. Place temporary fencing a minimum of 4 feet away from any part of buildings or structures being secured unless doing so would create an encroachment upon, or damage to, adjacent private property.

b. Trim or cut back small tree limbs and shrubs as necessary to insure proper installation of the fencing.

c. Always allow continued access for Metro-North patrons and its employees to access to and from each station platform during construction activities.

2. When required for security purposes, provide a 7-foot high temporary chain link fence consisting of 6-foot high fence fabric affixed to fence posts with one foot high extensions supporting 3 strands of barbed wire along the top edge of the fence to deter persons from climbing over the fence, and extending to within a few inches of the surface supporting the fence to prevent persons from crawling under the fence.

3. Wire Fabric:

a. Wire: 11 gauge or heavier steel wire galvanized in accordance with the requirements specified in ASTM A 392.

b. Mesh Size: 2 inches, minimum.

c. Breakload Strength: 850 pounds force, minimum.

4. Fence Posts:

a. Material: Galvanized steel schedule 40 pipe complying with the requirements specified in ASTM F 1083.

b. Nominal Outside Diameter: 2 inches, minimum.

c. Height: As required for the size fence indicated.

5. Post Bases:

a. Provide appropriate bases for the surface supporting the fence, generally flat galvanized steel plate welded to the bottom of the fence posts or concrete formed around the fence posts.

b. Provide a means to adequately anchor the posts to the surface supporting the fence so the fence cannot easily be moved out of place.

C. Temporary Protective Walkways:

1. Provide covered walkways required by governing authorities for public rights-of-way.

2. Provide temporary pedestrian passageways as detailed on the Contract Drawings and where indicated or required.

3. Always allow continued access for Metro-North patrons and its employees to access to and from each station platform during construction activities.

D. Temporary Security Barriers:

1. Provide temporary barriers and enclosures to prevent unauthorized entry to construction areas, vandalism, and theft.

2. Padlocks and Hasps:

a. Provide a heavy duty padlock and hasp for securing temporary doors.

b. Manufacturers:

1) American Lock, Number A1305, www.americanlock.com.

2) Abus Lock, www.abuslock.com.

E. Temporary Tree and Plant Protection:

1. Tree Protection Fencing Plan:

a. Prepare a Tree Protection Fencing Plan indicating the locations, extent, and

perimeters of the trees and other vegetation to be protected as shown on the Contract Drawings and determined by onsite inspections.

1) Submit the Tree Protection Fencing Plan, including Shop Drawings showing the locations and details of protective fencing, to the Construction Manager for approval.

b. Install protective fencing after receiving approval of the Tree Protection Fencing Plan but before starting other construction activities.

c. The Owner reserves the right to require the Contractor to provide more substantial "heavy duty" protective fencing when, the vegetation is damaged or endangered by the Contractor's or Subcontractor's actions, or failure to take measures to protect the subject vegetation.

2. Protection of Existing Vegetation:

a. Identify, protect, and maintain existing vegetation within the protected areas indicated on the Contract Drawings during the Contract from the Notice-To-Proceed to Final Acceptance.

1) Perform the Work of this Section in accordance with the standards of the Tree Care Industry Association (TCIA).

2) Complete the installation of protective fencing prior to starting any other work in the vicinity of protected vegetation.

3) Do not perform any work within the protected areas unless approved.

4) Do not store materials within the protected areas.

5) Do not permit vehicle parking, foot traffic, or other activity not approved in writing within the protected areas.

b. Provide labor and new and undamaged materials that constitute "Best Practice" to meet the letter and intent of this Contract.

1) Follow the safety requirements of ANSI Z133.1.

3. Lay Out Protective Fencing:

a. In order to protect existing vegetation indicated as remaining in the Contract Drawings, lay out the location of protective fencing as suggested by the Project Arborist.

1) Field measure and stake the locations of project improvements as needed to establish the locations of protective fencing.

2) Prior to installing the tree protection fencing, lay out the proposed fencing locations as shown on the approved Tree Protection Fencing Plan submittal drawings with paint and/or stakes and string for review and approval.

3) Make adjustments in the fence locations and alignments as directed by the Program/Project Manager.

4. Install Protective Fence Posts:

a. Install metal fence posts plumb and evenly spaced a maximum of eight feet apart on center.

b. Insert the fence posts 18 to 24 inches into the ground, and ensure that the installed post height above grade is within four inches of adjacent post heights.

5. Install Fence Fabric:

a. Use the longest continuous lengths of fence fabric possible for each application.

1) Terminate the ends of the fence fabric lengths at fence posts; and provide 12 inches, minimum, of full height overlap at each fence fabric end.

b. Stretch the fencing fabric tightly between fence posts.

c. Fasten the fence fabric firmly to the fence posts with the specified ties two inches below the top of each post, at the mid-point of each post, and at the point on each post three inches above the finish grade.

6. Install Heavy Duty Protective Fencing:

a. The conditions may require the substitution of more substantial heavy duty protective fencing for the protective fencing at select locations.

b. Install heavy duty protective fencing at the locations indicated by the Project Arborist.

7. Excavating Around Trees and Shrubs:

a. Excavate around trees and shrubs within protected areas only where indicated on the Contract Drawings.

1) When work that may impact protected plants occurs, plan the work to assure minimal disturbance to the plants, follow good horticultural practices, and direct pruning and wound treatment in accordance with this Section.

8. Protecting Root Systems:

a. Protect root systems from damage due to run-off or spillage of noxious materials in solution during storage or construction activities.

1) Protect root systems from flooding or soil erosion.

2) Provide a minimum of 2 layers of untreated burlap as a covering over exposed root face areas.

b. Do not disturb or excavate protected root zone areas unless specifically authorized

to do so.

1) Where trenching for utilities is required within protected areas, excavate under or over roots by hand digging under the authority of the Project Arborist.

2) If large roots are encountered, or if a condition potentially fatal to the plant is observed, provide notification prior to continuing or commencing work.

3) Do not cut main lateral roots or taproots, those 2-1/2 inches in diameter or greater; however, smaller roots that interfere with the installation of new work may be cut.

   a) Cut smaller roots with sharp pruning instruments, but do not break or chop roots.

   b) Excavate root systems by hand in areas where new construction is required within protected areas.

   c) Use a narrow-tine spading fork to expose roots.

   d) Cut exposed roots back from the new construction.

4) Do not permit exposed roots to dry out before permanent backfills is placed.

   a) Provide temporary earth cover, or pack the roots with peat moss, and wrap the roots with burlap.

   b) Water and maintain the roots in a moist condition, and temporarily support and protect them from damage until they are permanently relocated and covered with backfill.

5) Provide imported topsoil backfill to cover exposed roots in soil cuts.

6) Do not overload root zones by placing backfill above the existing grade.

3.7 TEMPORARY CONTROLS

A. Temporary Erosion and Sediment Control:

1. Temporary Erosion and Water Pollution Control Plan:

   a. Prepare a Temporary Erosion and Water Pollution Control Plan indicating all proposed temporary erosion and water pollution controls to the Construction Manager for approval.

      1) Include Working Drawings showing the proposed temporary erosion and sediment controls.

   b. Submit the Temporary Erosion and Water Pollution Control Plan to the Construction Manager for approval.

2. Provide temporary erosion and sediment control as required.

    a. Protect grades and slopes susceptible to erosion.

    b. Place seed free hay bales, construct silt barrier fence with geotextile fabric, and construct temporary berms, dikes, dams, or ditching and other control measures as may be required.

    c. Subject to approval by the Construction Manager, install and maintain temporary erosion and sediment controls as indicated in the Contract Documents until permanent erosion control features are in place.

3. Hay Bale Installation:

    a. Install seed free hay bales to provide sedimentation control at the locations indicated on the Contract Drawings, at other locations throughout the work area as required to provide erosion protection, and as directed.

    b. Place bales as indicated on the Contract Drawings.

        1) If hay bale installation is not indicated, place hay bales in a row with the ends abutting one another.

        2) Anchor hay bales in place with 2 stakes driven through the bales and sunk a minimum of 1-1/2 feet into stabilized earth.

            a) Angle the initial stake to previously laid hay bales to force the bales together.

            b) Drive stakes to be flush with the top of the hay bale.

4. Silt Barrier Fence Installation:

    a. Construct silt barrier fence at the locations indicated or proposed on the Contract Drawings or Working Drawings.

    b. Construct the silt barrier fencing with or without wire-mesh support, and fasten the silt barrier to support posts as follows:

        1) Install posts and excavate a shallow trench on the protected side of the fence.

        2) Fasten the fabric securely to the top of the posts and wire-mesh, if applicable, at a maximum spacing of 30 inches.

            a) Make sure that sag of the fabric is kept to a minimum.

            b) Extend the fabric a minimum of 6 inches into the excavated trench, then backfill the trench with the excavated soil and compact.

5. Construction Entrance and Sediment Trap Construction:

    a. Construct each construction entrance and sediment trap as shown on the Contract

Drawings and to the depths indicated.

B. Temporary Pest Control:

1. Provide measures to control birds, vermin, and insect pests at the Site so they do not present a health hazard or nuisance.

2. Provide rodent-proof refuse containers for "non-construction" refuse such as food waste and packaging materials.

C. Temporary Environmental Controls:

1. Provide temporary environmental controls to facilitate construction.

a. Provide equipment required to furnish proper ambient conditions for applying, curing, or preserving materials as specified in other Sections; such as dehumidifiers to adjust the humidity, fans to furnish ventilation, or portable heaters to adjust the temperature as specified in other Sections.

b. Provide the temporary enclosures required for encapsulating environmentally sensitive areas containing lead, asbestos, PCBs, mold, or other toxic or hazardous materials as specified in other Sections that describe procedures for their remediation or abatement.

2. Air Pollution:

a. Prevent polluting the air in violation of the requirements in any local municipality's ordinances.

3. Noise Control:

a. Ensure that noise produced by equipment and construction operations does not exceed established regulatory limits stipulated in any local municipality's ordinances.

b. Equip construction vehicles with operating noise control devices.

D. Temporary Storm Water Pollution Control:

1. During earthwork operations, take additional precautions as required and as directed by the Construction Manager to prevent water runoff from eroding completed work and to prevent surface water and sediment from leaving the Site, including the construction of retention basins, channels, or similar structures.

2. Clean paved areas of accumulated dirt and debris to prevent it being washed into low-lying areas, or fouling storm sewers and catch basins.

3. Prevent concrete trucks being washed onsite.

4. Construct temporary drainage structure inlet filter protection as detailed on the Contract Drawings to prevent sediment from entering the drainage system by ponding water to allow sediment to fall out of suspension.

5. Surface water:

   a. Do not allow water to collect on the Site.

   b. Where required, provide positive means to remove water such as trenching or pumping.

E. Site Watering for Dust Control:

1. Control dust at all times.

   a. Perform vacuuming, wet mopping, wet sweeping, or wet power brooming in lieu of dry power brooming or air blowing.

   b. Perform only wet cutting of concrete block, concrete, and asphalt.

2. Treat material stockpiles and disturbed soil with dust suppressors, such as water or other palliatives, and/or provide covers to control dust.

3.8 PROJECT IDENTIFICATION

A. Temporary Project Signage:

1. Provide two field office signs each having a minimum of 70 character spaces, and lettering styles, colors, and proportions as directed by the Construction Manager.

   a. Construct the field office signs from a single 8 feet wide by 4 feet high sheet of exterior A-B grade plywood securely bolt-mounted to 4-inch by 4-inch posts constructed from pressure treated construction grade lumber set at a minimum depth of 4 feet below grade.

   b. Paint both sides of the field office signs with one coat of primer-sealer finished with two coats of white semi-gloss enamel.

2. Securely mount the field office signs where directed by the Construction Manager, and so they are resistant to vandalism and theft.

3. Submit Shop Drawings showing the temporary project signage message and layout to the Construction Manager for approval.

3.9 REPAIR/RESTORATION

A. Complete, or, if necessary, restore permanent work which may have been delayed because of interference with the temporary service or facility.

B. Repair damaged Work, clean exposed surfaces, and replace Work which cannot be satisfactorily repaired.

1. Clean and repair damage caused by installation or use of temporary work.

C. Traffic Control:

1. Restore obstructed public ways, including streets, sidewalks, and accesses to public and private properties, to public and private uses when obstruction thereto is no longer necessary for prosecution of the Project.

D. Landscaping:

1. Restore all landscape areas and other surface improvements that were to remain in place, but that have been damaged by the Contractor's actions or omissions.

a. Restore landscape areas as nearly as possible to the original condition.

2. Repairing or Replacing Damaged Plants:

a. Where damage to vegetation has occurred, prune plants in accordance with Tree Care Industry Association (TCIA) standards to remove branches from the work area, and where needed to maintain the health of the plant.

1) Remove material in a manner that yields minimal impact and is approved.

b. Remove plants that were identified by the Owner to remain in place, but that are damaged during the course of the work to an extent that they cannot be repaired; and replace the damaged plants with new plants of the same type and value.

1) Remove and replace damaged plants as directed.

2) Base the value of plants that are to be replaced on the criteria found in the Council of Tree and Landscape Appraisers' "Guide for Plant Appraisal," as evaluated by the Project Arborist.

c. Remove and replace damaged plants at no increase in the Contract Price.

1) Bear the cost of Consultants, administrative costs, coordination, permits and other fees associated with the removal, replacement, or repair of existing plants resulting from damage due to insufficient or improper protection.

3.10 RE-INSTALLATION

A. Restore or re-install permanent facilities, used during construction, to the condition specified.

3.11 SITE QUALITY CONTROL

A. Site Tests:

1. The Construction Manager has the authority to order testing of the Contractor's construction plants and equipment; and to reject or condemn any plant, apparatus, or staging, which, in his opinion, is unsafe, improper, or inadequate.

a. Whether the Construction Manager exercises this authority or not, the Contractor is

not relieved of his responsibility for the safe, proper, and lawful construction, maintenance, and use of such plant, apparatus, or staging.

B. Site Inspections:

1. Inspect the maintenance and protection of traffic (MPT) placed on a twice daily basis.

a. Inspect the MPT devices first thing to verify their integrity, and again at the end of the shift for the same purpose.

2. Inspect the sediment and erosion control and storm water controls protections and devices not less than once per week.

3. Inspect the sediment and erosion control and storm water controls protections and devices prior to predicted storm events, and again after storm events.

C. Non-Conforming Work:

1. Immediately upon discovering defective maintenance and protection of traffic (MPT) items, remedy the deficiencies.

2. Repair or replace defection sediment and erosion control protections within 24 hours.

3. Rework condemned construction plants or equipment to an acceptable condition or remove them from the Site and replace them within five (5) Days from the date of instruction of the Construction Manager.

3.12 CLEANING

A. Furnish daily janitorial and housekeeping services at the Work Site and perform any required maintenance of facilities as deemed necessary by the Construction Manager.

1. Landscaping:

a. Clean up the ground areas under plants remaining in place as directed.

b. Wash off foliage that becomes soiled, or when directed to do so Project Arborist.

c. Remove materials that fall or flow into protected areas.

1) Provide protective barriers as needed or as directed by the Construction Manager or Project Arborist to prevent materials from falling or flowing into protected areas.

2. Construction Facilities:

a. Clean the field office(s) daily or as required by the Construction Manager.

b. Remove snow in and around the field trailers and adjacent parking areas.

B. At Substantial Completion, clean and renovate permanent services and facilities that have been

used to provide temporary services and facilities during the construction period, including but not limited to the following:

1. Replace air filters and clean the outside of ductwork and housings.

2. Replace significantly worn parts and parts that have been subject to unusual operating conditions.

3. Replace lamps in the lighting system that are burned out or noticeably dimmed by substantial hours of use.

C. Remove all temporary facilities and controls prior to Final Acceptance.

1. Upon completion of the Contract, remove all temporary facilities from the Site, except those designated to remain.

a. Remove temporary utilities, equipment, facilities, and materials prior to submitting the Final Application for Payment.

b. Remove any temporary underground installations to a minimum depth of 2 feet.

2. Temporary Utilities:

a. Remove and dispose of the materials and equipment furnished for temporary utility services for this Contract as part of final cleanup, except as specified herein.

1) All costs for this removal and disposal is the responsibility of the Contractor.

2) Unless the Construction Manager requests that it be maintained for a longer period of time, remove each temporary service and facility promptly when the need for it or a substantial portion of it has ended, or when it has been replaced by the authorized use of a permanent facility, but no later than substantial completion.

3. Construction Facilities:

a. Upon completion of the Contract, the Field office becomes the property of the Contractor, and the Contractor is responsible for removal, dismantling, or otherwise disposing of the field office(s) at that time.

4. Temporary Barriers and Enclosures:

a. Remove fencing and related materials as directed during the Final Acceptance process at the end of the Contract.

5. Temporary Controls:

a. When the silt barrier fence is no longer needed, remove the fence and restore the area.

b. Remove temporary traffic control devices as soon as construction activities have been completed.

6. Project Identification:

a. Upon completion of the Work, remove and legally dispose of the temporary Project signage and posts, and backfill the post holes.

1) Turn all other signs over to Metro-North (MNR).

a) The Contractor will be charged $250 for each sign not turned over to MNR.

D. Waste Management:

1. Comply with the requirements of the approved Waste Management Plan specified in Section 01 74 00, Cleaning and Waste Management.

a. Frequently clean up refuse, rubbish, scrap materials, and debris caused by operations so that the Site presents a neat, orderly, and workmanlike appearance.

b. Provide daily collection of rubbish, and clean up the Work and access areas.

c. Load and cover trucks in a manner that will prevent dropping material and debris while in transit.

2. Provide for the disposal of waste products, trash, debris, and similar materials not required for the performance of the Work.

a. Remove surplus materials, falsework, and other temporary structures including foundations.

b. Make arrangements to legally dispose of the refuse, rubbish, scrap materials, and debris caused by operations off-site.

3. Gather and dispose of spoils and vegetative waste, including dead and damaged plants and the trimmings accumulated from the operations to clear and remove existing vegetation.

4. Dispose of spoils and vegetative waste off-site in conformance with the regulations imposed by the local authorities, and in an area approved for such disposal by the local authorities.

3.13 PROTECTION

A. Until final acceptance of the work by Metro-North, take charge and care of the temporary facilities and controls, and take reasonable precautions to protect them against injury or damage by action of the elements, theft, vandalism, or from any other cause, whether arising from the execution or from the non- execution of the Work.

1. Rebuild, repair, restore, and make good, to the satisfaction of the Construction Manager, injuries or damages to any portion of the Work occasioned by any of the above causes before Final Acceptance, and bear the expense thereof at no cost to Metro-North.

B. Provide and maintain security services for the field office during the entire Contract period.

3.14 MAINTENANCE

A. Maintenance for Field Offices:

1. Furnish maintenance, a paper supply, and ink cartridges for the color copier.

a. Provide the following initial supply of paper:

1) 20 boxes of letter size (8-1/2 by 11 inches) paper.

2) 10 boxes of legal size (8-1/2 by 14 inches) paper.

3) 20 boxes of 11 by 17 inches size paper.

b. Provide the following supply of paper weekly or as required by the Construction Manager:

1) 4 boxes of letter size (8-1/2 by 11 inches) paper.

2) 1 box of legal size (8-1/2 by 14 inches) paper.

3) 1 box of 11 by 17 inches size paper.

c. At a minimum, maintain a two week supply of paper onsite at all times.

2. Furnish a maintenance contract for the photocopier effective for the duration of the Contract.

B. Maintenance of Temporary Traffic Control Devices:

1. Within 24 hours after temporary traffic control devices have been damaged, defaced, or otherwise rendered unfit, repair or clean those devices, or replace those devices with new devices.

C. Maintenance of Temporary Project Signage:

1. Maintain the field office signs in good condition, free of markings and dirt, and free of obstructions.

a. Replace damaged stickers as necessary.

b. Clean signs using soap and water or with cleaning solvents that will not damage the surface of the signs.

D. Maintenance of Temporary Electricity and Temporary Lighting:

1. Maintain temporary electrical and lighting equipment and wiring in a safe condition, and use it in a manner that does not constitute a hazard to persons or property.

E. Maintenance of Temporary Parking Areas and Pedestrian Access:

1. Maintain temporary parking areas and pedestrian access throughout all seasons, including

providing snow removal and salting.

2. Maintain surfaces to always be safe and puddle free.

F. Maintenance of Vegetation:

1. Care for and maintain existing vegetation within protected areas as indicated on the Contract Drawings.

a. Provide water and labor as needed for plant health, growth, and for washing down soiled foliage.

b. Provide fertilizer, deep root fertilization, pesticides, anti-desiccants, and other materials and labor as needed to maintain the existing plants in a healthy and growing condition.

c. Provide plant maintenance for the duration of the Contract, until Final Acceptance.

G. Maintenance of Protective Fencing:

1. Replace damaged or non-compliant protective fencing as required.

a. Remove and replace torn, deformed, or otherwise blemished mesh with sections of the minimum specified length.

b. Repair or replace damaged fencing immediately after damage occurs.

2. Maintain tree protection fencing upright and in good condition throughout the Contract until Final Acceptance.

H. Maintenance of Field Offices and Sheds:

1. Maintain the temporary facilities in a proper, safe, and sanitary operating condition for the duration of the Contract.

a. Continuously maintain the field office and provide janitorial services on a daily basis throughout the Contract.

b. Keep toilet facilities equipped, clean, and sanitary at all times.

I. Maintenance of Temporary Erosion and Sediment Controls:

1. After installing silt barrier fence, satisfactorily maintain the barrier fence.

a. The temporary erosion and sediment control fence fabric may require periodic cleaning, by tapping the dry fabric from the downstream side.

b. Maintain hay bales until they are no longer needed.

2. Repair:

a. Remove hay bales which deteriorate, and replace removed bales with new bales.

b. When directed, remove and replace barrier fence not functioning due to clogging, damage, or deterioration.

3. Maintain the stored areas of the construction entrance and sediment trap areas by replacing or cleaning fouled areas as required and as directed by the Construction Manager.

4. Maintain temporary erosion protection and surface water runoff controls until cuts, fills, embankments, permanent erosion protection, and final grading are completed.

a. Remove temporary sedimentation and erosion controls installed under this Contract when they are no longer required, when they interfere with construction, or when directed.

b. Receive approval prior to removing any temporary sedimentation and erosion controls.

END OF SECTION

SECTION 01 52 00 ENGINEER'S FIELD OFFICE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including the contract terms and conditions and other Division 1 specification sections, as applicable to this section.

1.2 SUMMARY

A. This section specifies the field office for the exclusive use of the Engineer and Metro-North Railroad for the duration of the contract, including contract closeout.

B. The Contractor shall provide, within 30 days from the receipt of the notice of award, an operational field office.

C. The field office may be 1) a temporary construction trailer, or 2) a space in an existing building rented/leased by the Contractor, or a combination thereof as necessary to accommodate the progression of work.

D. The Contractor will provide a field office as shown on the drawings if available or as otherwise agreed upon by the engineer.

E. Due to the large geographic area covered by this project, locate field office at the mid-point of the project limits, or locate multiple field offices as necessary as to follow / accommodate the progression of, the work.

1.3 STANDARDS AND REGULATIONS:

A. National Fire Protection Association (NFPA)

B. NFPA 70 National Electric Code.

C. New York Fire Prevention and Building Code.

D. Occupational Safety and Health Administration Standards (OSHA).

E. Underwriter's Laboratories, Incorporated (UL).

1.4 SUBMITTALS

A. Within 10 working days after the date of Award, a layout of construction plant, showing locations of temporary fences, roadways/driveways, buildings or sheds, Contractor's field offices, Metro-North's field office (including interior layout), parking areas, temporary utility services, and storage and lay down areas. Include listing of office amenities to be included.

B. Shop drawings of the field office for review by the Engineer.

1.5 QUALITY ASSURANCE

A. The field office shall meet the requirements of all applicable building codes.

PART 2 - PRODUCTS

2.1 FIELD OFFICE

The field office shall meet or exceed the following requirements. The field office shall be equipped as follows and maintained in a condition satisfactory to the Engineer:

A. The Metro-North Office shall be comprised of one approved weatherproof building for offices and a conference room at the site. The structure shall have a minimum ceiling height of 7 feet and shall be provided with weatherproof doors and windows. Doors and windows shall be lockable. Each window shall have a minimum area of 8 square feet and be of a type that will open and close to provide adequate ventilation. Windows shall be secured with expanded metal grating and/or steel bars. Doors shall be equipped with lockable doorknob and separate deadbolt keyed alike. In addition to door locks, the doors shall be secured with steel bars secured with pad locks. All windows shall be equipped with window shades and/or mini blinds as directed by the Engineer. The structure shall be fully skirted with vinyl or aluminum siding, or painted plywood as agreed upon by the Engineer. Interior and exterior plumbing shall be maintained from freezing; suitable heat trace system or temporary heating shall be provided. The Contractor shall provide (5) sets of keys to the Engineer.

B. The office shall provide a minimum six hundred and fifty square feet (650 sqft) of floor space with a minimum of (2) two outside doors and eight (8) windows. Security screens shall be placed on windows and locks and security bars shall be placed on access doors, unless otherwise directed by the Engineer. The trailer shall be partitioned to provide three (3) rooms with adjoining doors. The smaller spaces on each end of the trailer shall be not less than (200) two hundred square feet in net floor area and shall contain two (2) of the six (6) windows and one (1) office shall contain one (1) of the outside doors.

C. Exterior entrances shall be equipped with stairways and ramps as to provide code complaint entry and egress in accordance with applicable provisions of the latest NYS uniform code. Suitable hard surfaced walkways shall be provided from the Engineer's office and the parking locations. Exterior walking surfaces shall be suitably maintained throughout the duration of the contract, including the removal and treatment of ice and snow.

D. The field office shall meet the requirements of the NYS uniform code. If the field office is on Metro-North property, it shall meet Metro-North requirements. If not on Metro-North property, the field office shall meet local codes. A certificate of Occupancy (CO) shall be required for all locations. Field offices shall be equipped with the following to obtain a CO:

1. Emergency Exit signs with battery backup at each egress point.

2. Fire alarm panel equipped with smoke detectors, pull stations at each exit door, horn strobes, and dialer connected and programmed with the following phone numbers:

a. Central alarm monitoring company approved by the Engineer

b. MTA Police (800) 836-6673

c. Metro-North Rail Traffic Controller (212) 34-2050

d. Local Fire Department or fire dispatch (number to be determined on a case-by-case basis)

3. Fire extinguishers – ABC Type – 20 lbs or larger

4. Evacuation Plan – conspicuously posted in office, include Muster Point

5. Emergency Contacts List - conspicuously posted in office

6. First Aid Kit

E. Maintenance: The Contractor shall maintain all facilities and furnished equipment in good working condition for the duration of the Contract. The office shall be cleaned weekly (at a minimum) or as required by the Engineer.

F. Parking Spaces: The Contractor shall provide Metro-North with 8 parking spaces (including snow removal and maintenance) adjacent to the field office location. Parking areas shall be prepared by removal/stockpiling of topsoil, grading, placement and compaction of suitable temporary subbase driveway surface with suitable hard surfaced walkways. Parking surfaces shall be maintained through the contract, including the removal of ice and snow. Site shall be restored prior to Final Completion, including removal of subbase, placement/grading of topsoil, seeded, and grass established.

G. Post Office Box: A post office box shall be provided at the nearest U.S. Post Office as directed by the Engineer.

H. Telephone: The Contractor shall supply a phone system and telecom service for use during the construction period and through Project Closeout. Provide telephone service consisting of four lines, two general use telephone lines, one dedicated Metro-North telephone line (on the Metro-North system if available), and one fax line. The Contractor shall supply 5 phones for the exclusive use of Metro-North. The phones shall have modular jacks (as directed by the Engineer) at the wall and phone and be adaptable to electronic communications. The phones shall be configured for two line operation with speaker phone. One phone shall be a single line phone for use on the dedicated Metro-North line and another phone line shall be used for the fax machine. Phones shall be installed at locations as directed by the Engineer. Two two-line phones shall be equipped with a 25 foot cord.

I. Telephone Answering Machine: FCC approved automatic answering device capable of recording outgoing messages of 60 seconds long and receiving a minimum of 40 incoming messages of 60 seconds duration. The unit shall include a message mark to permit review of new messages without erasing old messages. The unit shall include remote programming of playback, backspace, and out-going message re-record. The unit shall include computer-generated voice marking time and day of each message received. The unit shall allow for the retrieval of messages without a remote beeper unit.

J. Internet / WiFi: The Contractor shall supply a DSL or high speed cable modem internet connection for use during the construction period and through Project Closeout. The Contractor shall provide a secured wireless modem. The Contractor shall establish a project specific email address as approved by the Engineer.

K. E-Mail Address: As approved by the Engineer, the Contractor shall establish and maintain a project specific e-mail address for use during the construction period and through Project Closeout.

L. The field office shall be equipped as follows and maintained in a condition satisfactory to the Engineer:

1. Fire Extinguishers: Non-toxic dry chemical, meeting Underwriters Laboratories, Inc., approval for Class A, Class B and Class C fires with a minimum rating of 2A:10B:10C. One 20 lb. extinguisher per room for all locations.

2. First Aid Kit: Keep the kit properly stocked with appropriate first aid supplies at all times. First Aid Kit shall be Johnson & Johnson® 158 Piece Professional/Office First Aid Kit for 25 People, Plastic Case.

3. Toilet: A separately enclosed room, properly ventilated and complying with applicable sanitary codes. The Contractor shall provide all lavatory amenities, necessary paper and soap products, hot and cold running water and a flush-type toilet. The Contractor shall replenish the supplies as required. The Contractor shall provide for regular cleaning of the bathroom as to maintain it in a sanitary condition.

4. Heating and Air Conditioning: Provide and maintain a heating and air conditioning system capable of maintaining an ambient air temperature of 70° F ± 5°.

5. Lighting: Provide and maintain electric lighting. Lighting shall be provided via non-glare type luminaries providing a minimum illumination level of 100 foot-candles at desk height.

6. Fire Resistant File Cabinet: Provide two (2) - four (4) drawer, legal size file cabinets with lock and two keys, meeting the requirements for "Insulating Filing Devices, Class 350-1 Hour (D)" of ANSI/UL 72 or the Class D rating of the original Underwriters Laboratories specification for insulated filing devices.

7. Vertical Plan Rack: Provide one (1) mobile/rolling vertical plan rack capable of holding a minimum of twelve (12) sets of plans.

8. Locker or Closet: Provide one (1) metal or wood locker with lock of sufficient size for storage of surveying instruments and testing equipment.

9. Metal Storage Cabinet: Provide (1) vertical metal storage cabinet equipped with adjustable shelves, locking handles, and two (2) keys (approximately 78” high, 48” wide, 24” deep)

10. Office Desks: Provide four (4) office desks. Desks shall have minimum dimensions of 5.0’ x 2.5’ and be equipped with lockable drawers. (HON® Metro Classic 60" Double Pedestal Desk, Charcoal/Gray, or approved equal)

11. Office/Desk Chairs: Provide five (5) ergonomic office/desk chairs. Chairs shall be fully assembled and equipped with arms, five (5) legs with casters, and adjustable from approximately 17” to 23” height by pneumatic gas cylinder. (Staples Vocazo Mesh Manager's Chair, Black, or approved equal)

12. Drafting Table & Stool: Provide one (1) drafting table and one (1) draftsman's stool. Drafting table shall have minimum dimensions of 6.0' x 3.0', capable of supporting 200 pounds supported by wall brackets and legs. (HON® Comfortask® Fabric Task/Swivel Stool, Black)

13. Conference Table & Chairs: Provide meeting table as necessary to accommodate a 20+ person meeting, and twenty (20) chairs. Conference table can be a comprised of 8' x 3' folding tables.

14. Bookshelves: Provide two (2) four (4) shelf bookshelves approximately 4' x 4'.

15. Photocopy Multi-Function Color Office Machine: Provide one (1) multi-function (copy, print, scan, fax) office machine with the features listed below. The machine shall be networked to the field office computer network for all features. (Ricoh Aficio MP C2051, or approved equal)

    a. Color Printing

    b. Two-sided option

    c. Collating

    d. Stapling

    e. Enlargements to 400%

    f. 8 ½" x 11" paper

    g. 8 ½" x 14" paper

    h. 11" x 17" paper

    i. Scan

    j. Fax

    k. Print

    l. Hot Spot enabled

16. Office Supplies: Provide and maintain a minimum of a (2) two-week supply of toner cartridges, staple cartridges, and paper of all sizes (i.e. letter, legal, ledger). Replenish as requested by the Engineer.

17. Laptop Computers: Provide three (3) laptop computers having the following minimum requirements listed below. Computers will be returned to the Contractor upon completion of Project Closeout.

    a. HP/DELL/Lenovo/MSI or approved equal with Processor 8th Generation Intel® Core™ i5/i7 processor (minimum 4 cores @ 2.8 GHz or greater)

b. 15-inch Display or larger

c. 8GB Memory or greater

d. 500GB SSD Hard Drive

e. External Corded Mouse

f. Surge Protector with Active GFI

g. Laptop bag with accessory pockets

18. Tablet Computers: Provide two (2) Microsoft Surface 7th Generation or newer core i3/i5 systems. Each must include a waterproof/impact-resistant case such as *aXtion Pro M* or approved equal.

19. Computer Software: All computer software indicated below shall be loaded into the computers with manuals and original disks for use by Metro-North. Software shall be new and unused. Software required shall include the following:

    a. Windows® 10 Professional, 64Bit, English

    b. Microsoft Office 2016 Professional Suite, including Microsoft Visio

    c. AutoCADD 2018

    d. Norton Anti-Virus Protection, or approved equal, including update service for life of contract through Project Closeout.

    e. Adobe Acrobat Professional

    f. Primavera Project Planner (Software to be compatible with Project Schedule format).

20. Portable Hard Drives: Provide two (2) Seagate/Western Digital, or approved equal, USB 3.0 compatible plug-and play storage devices at least 2TB in size. The portable hard drives will be for the long-term backup of field office files and final delivery to Metro-North. All will remain the property of Metro-North at Project Close-Out.

21. The above computers and printer equipment shall include all cables and software. All equipment shall be set up as a Wireless Local Area Network with access to the Internet utilizing a DSL high speed or cable connection for the duration of the Contract.

22. Memory Sticks: Provide two (2) USB 3.0 Memory Sticks of at least 32GB in size.

23. Camera: Three (3) digital cameras of 10 megapixels minimum. Include storage cards of 16 GB or larger in size. The three (3) cameras will be returned to the Contractor at Project Close-Out. The data storage cards will remain the property of Metro-North Railroad.

24. Refrigerator: One (1) self-defrosting refrigerator; minimum of (6) six cubic feet interior storage size, equipped with full range thermostatic dial control.

25. Microwave: 2.0 cu. ft. Countertop Microwave with Sensor Cooking Controls.

26. Dry Erase Board: Provide three (3) wall mounted dry erase boards (minimum size 4' wide x 3' height). Three (3) sets of multi-color (black, blue, red, green) dry erase markers, board cleaner, and erasers; to be replaced as necessary.

27. Pencil Sharpener: Provide one (1) electric pencil sharpener. (X-ACTO Powerhouse 1792 Electric Pencil Sharpener, or approved equal)

28. Potable Water: Bottled water delivery service with refrigerated bottled water dispenser capable of providing both hot and cold water.

29. Waste Receptacles: Provide four (4) ten (10) gallon office waste baskets. Provide (2) recycling receptacles; one for paper and one for bottles and cans.

~~30.~~ Measuring Wheel. Provide (3) measuring wheels in US Customary units. (Rolatape 32-400 Professional Series 4-Foot Measuring Wheel, or approved equal)

31. Carpenter's Level: Provide (3) carpenter's levels; (2) 4' long, (1) 8' long

32. Straight Edge: Provide (1) 10' straight edge

33. Thermometer: Provide (1) thermometer that can record minimum and maximum temperatures. (Sper Scientific 736680, or approved equal)

34. At least one copy of ASME A17.1/CSA B44 (2013); Guide for Inspection of Elevaotrs, Escalations, and Moving walks, ASME A17.2.

2.2 SPECIAL REQUIREMENTS FOR OFFICE TRAILERS

A. Trailers shall be set, leveled and secured on suitable temporary foundations. Temporary foundations shall be designed in accordance with the trailer manufacturer's instructions, ground conditions, and intended loads.

B. Trailers shall be equipped with suitable tie-downs/anchorages to prevent overturning. Tie-down anchorages shall be designed and installed to transfer the anchoring loads to the ground, including wind loads of 110 mph. The load-carrying portion of the ground anchors shall be installed to the full depth called for by the manufacturer's installation directions

C. Provide adequate drainage around trailer and walkways. Grade areas surrounding trailers as needed to maintain positive drainage away from the trailer and prevent ponding or pooling. Provide roof runoff diverters, gutters, and leaders as appropriate.

D. Trailers shall be equipped with a restroom with functioning toilet and lavatory with hot and cold running water. Trailers shall be equipped with appropriate black and gray water collection system.

Provide freeze protection as required.

E. Supply and waste plumbing shall be equipped with suitable freeze protection. In addition to heat tracing of plumbing lines, trailers shall be skirted as necessary to supplement freeze protection.

F. Maintain stairs and walkways free of standing water, snow and ice.

PART 3 - EXECUTION

3.1 GENERAL

A. Transmit submittals required by this Section.

B. Furnish products as indicated.

C. Secure permits for temporary utility services including connection and disconnection.

3.2 CONTRACTOR'S FIELD OFFICE:

A. Establish and maintain a Field Office adjacent to the Metro-North field office, or as agreed upon by the Engineer.

3.3 METRO-NORTH FIELD OFFICE:

A. The Contractor shall furnish and install field offices meeting these requirements within 20 days of the Notice of Award and for the duration of the Contract including Contract Close-Out.

B. Unless otherwise noted, all equipment, furnishings, etc. shall be returned to the Contractor at Contract Close-Out.

C. The location of the field office shall be as shown on the drawings, if available, or as agreed upon by the Engineer.

D. Maintain all facilities and furnished equipment in good working condition. The office shall be cleaned weekly (at a minimum), or as required by Metro-North.

E. Connect the field office to utilities (power and telephone). The Contractor shall bear all costs associated with this work (including temporary if necessary) and be responsible for obtaining any necessary permits. The electric service shall be of sufficient capacity to adequately supply power to the trailer and all amenities, including but not limited to, lighting, HVAC, pumps, refrigerator, heat trace/freeze protection, office machines, computers, and other project related equipment. Should local utilities not be readily available within 20 days of Award, the Contractor shall provide and maintain temporary power (i.e. generator) until utilities are activated.

F. Telephone services shall be operational within 20 days of the Notice of Award.

G. The Contractor shall be responsible for all equipment and furnishings, including installation, maintenance and security, for the duration of the project.

END OF SECTION

SECTION 01 71 00 - EXAMINATION AND PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and other Division 01 Specification Sections, apply to the Work of this Section.

1.2 RELATED SECTIONS

A. Section 01 33 00 - Submittal Procedures.

B. Section 01 50 00 - Temporary Facilities and Controls.

C. Section 03 30 00 - Cast-In-Place Concrete.

D. Section 31 00 00 - Earth Moving.

1.3 SUMMARY

A. This Section specifies requirements for:
   1. Acceptance of conditions.
   2. Field engineering.
   3. Protection of adjacent construction.

B. Requirements for demobilization are specified in Section 01 71 13, Mobilization.

1.4 REFERENCES

A. Reference Standards:
   1. ASTM International (ASTM):
      a. ASTM B36/B36M, Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar.
   2. New York State Department of Transportation:
      a. Land Survey Standards and Procedure manual (February 2009)
   3. Precast/Prestressed Concrete Institute (PCI)
      a. PCI MNL-116, Manual for Quality Control for Plants and Production of Structural Precast Concrete Products.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Surveyor Crew's Qualifications:

a. Employ a survey crew qualified and able to perform the surveying and layout tasks necessary to properly perform the Work of this Section.
   1) The survey crew must be available for use with as little as 4 hours advance notice for the duration of the Contract.
b. Employ a Professional Engineer or Land Surveyor registered in the State of New York to be directly responsible for the survey work required by this Contract.
   1) Submit the qualifications of the registered Professional Engineer or Land Surveyor to the Construction Manager for information.

1.6 SUBMITTALS

A. Action Submittals:
   1. Submit the following to the Construction Manager for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
      a. Shop Drawings:
         1) Concrete survey monuments.
      b. Delegated Design Submittals:
         1) Field engineering layouts.
      c. Qualification Statements:
         1) Land Surveyor qualifications.

B. Closeout Submittals:
   1. Submit the following to the Construction Manager in accordance with the requirements of Metro-North:
      a. Record Documentation:
         1) Survey field books and stakeout data, including documentation verifying the accuracy of field survey work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete:
   1. Provide concrete with a minimum compressive strength of 4,000 psi at 28 days in compliance with the requirements for Class A concrete as specified in Section 03 30 00, Cast-In-Place Concrete.

B. Materials required for mobilization that are not to be part of the completed Contract will be determined by the Contractor, except that they must conform to any pertinent local or State Law, regulation or code.

PART 3 - EXECUTION

3.1 PREPARATION

A. Demolition / Removal:
   1. Remove obstructions from lines of sight when requested to do so by the Construction Manager.

3.2 ACCEPTANCE OF CONDITIONS

A. The Contractor is responsible for visiting and examining each station Site to determine the conditions existing there prior to performing the Work, for inspecting areas where specific portions of the Work will be performed; and for notifying the Construction Manager of unsatisfactory conditions discovered during this inspection.
   1. Specific requirements to examine, inspect, and verify existing conditions prior to performing specific portions of the Work are specified in individual Specification Sections, and the Contractor is responsible for performing these field inspections.

B. Failure to notify the Construction Manager of unsatisfactory conditions at the various station Sites following the required inspections constitutes acceptance of the existing conditions as not a hindrance to performing the Work as contracted.
   1. Failure to execute the required field inspections, or to notify the Construction Manager of unsatisfactory conditions discovered, does not relieve the Contractor from performing the Work.

3.3 FIELD ENGINEERING

A. Verification of Conditions:
   1. Find the reference points that have been shown on the Contract Drawings at each station Site and re-established in the field.
      a. At his discretion, the Construction Manager may direct the Contractor to relocate or replace the established reference points in accordance with the applicable requirements for additional work outlined in the Contract Documents.
   2. Promptly notify the Construction Manager if it is found that any of the previously established reference points indicated have been destroyed or displaced.
      a. When directed by the Construction Manager, repair or replace previously established reference points, control monuments, and those primary control measurements that are damaged, destroyed, or displaced by the Contractor at no increase in Contract Price.

B. Furnish, install**,** monitor and subsequently remove survey points establishing the line and grade and other field stake-out engineering for construction.
   1. Furnish accurate surveyor instruments and other survey equipment suitable for performing the surveys required in accordance with recognized professional standards, and maintain the survey equipment in proper condition and adjustment at all times.
   2. Locate, stake**,** furnish, and install new concrete monuments.
      a. Construct survey monuments at locations shown on the Contract Drawings, or as directed by the Construction Manager.

3. Perform as-built surveys to comply with quality assurance, quality control, and acceptance testing requirements.
4. Check all surveys and layouts and calculations.

C. Surveying:
1. Temporarily cease construction activities which create hazards that may affect the work of the survey crew's personnel.
2. Establish all survey control points and alignments required for control and guidance of construction operations.
   a. Perform the Work to the lines and grades shown on the Contract Drawings.
   b. Use approved local municipality approved identifications for existing benchmarks.
   c. Refer to the legal descriptions provided for developing other control points.
   d. The Surveyor is responsible for any lines, grades, or measurements which do not comply with the specified or proper tolerances, or which are otherwise defective, and for any resultant defects in the work.
3. Provide any acceptance survey or surveys required for checking lines, grades, and measurements.
   a. Reference Points:
      1) Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work.
      2) Preserve and protect benchmarks and control points during construction operations.
   b. Record Log:
      1) Produce and maintain a log of layout control work.
      2) Record deviations from required lines and levels.
      3) Include beginning and ending dates and times of surveys, weather conditions, the name and duty of each party member, and the types of instruments and tapes used.
      4) Make the Record Log available for reference.
4. Provide the Construction Manager with any assistance required for checking lines, grades, and measurements when requested to do so by the Construction Manager.
   a. The Construction Manager may at any time use line and grade points and markers established by the Surveyor.
      1) The Surveyor's surveys are a part of the Work and may be checked by the Construction Manager or representatives of the Construction Manager at any time.
         a) Conduct resurveys or check surveys to correct errors indicated by review of the field notes at no increase in the Contract Price.
      2) Provide assistance to the Construction Manager required for checking lines, grades, and measurements.

D. Layout of Work:
1. Lay out the Work from the baselines and bench marks indicated on the Contract Drawings, making all measurements in reference to these baselines and bench marks.
   a. Furnish all monuments, stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the Work from the baselines and bench marks established.
   b. Assume full responsibility for the dimensions and elevations taken from bench marks and baselines, and for setting lines and grades.

1) Stakeout property lines and corners required for establishing the location of fences and other items of the Work referenced to the property lines and corners.
2) Stakeout the temporary, permanent, and existing easements.

E. Concrete Survey Monuments:
1. When directed to do so, replace damaged or destroyed control monuments and those primary control monuments that must be relocated in order to perform the Work of this Contract at no increase in the Contract Price, and as follows:
a. Construct a survey monument at each location shown on the Contract Drawings, or as directed by the Construction Manager.
b. Excavate a hole for each survey monument in accordance with the requirements of Section 31 00 00, Earth Moving, except that the equipment may consist of an approved type auger.
c. In the presence of the Construction Manager, set the survey monument into the hole with the top surface of the monument horizontal and with the brass marker on top oriented in the exact position shown on the Contract Drawings, or as directed by the Construction Manager.
d. Subsequent to placing the survey monument into the hole, backfill the space between the walls of the hole and the monument in accordance with the requirements of Section 3100 00, Earth Moving.
e. Set and backfill concrete monuments in the presence of the Construction Manager**.**

3.4 PROTECTION OF ADJACENT CONSTRUCTION

A. Protect buildings, foundations, bridges, and other structures located adjacent to the Site from damage.
1. Protect existing and adjoining public and private property from damage incidental to construction operations in accordance with the various station location municipality Construction Codes.
2. Where operations are adjacent to the property of railway, telegraph, telephone, water, sewer, electric, gas, cable, and other utilities; or adjacent to other facilities and property which if damaged might result in considerable expense, loss, inconvenience, injury, or death, do not commence the Work until necessary arrangements for protecting these facilities and property have been made.
3. Prevent earthwork and trenching operations from damaging adjacent facilities.
a. Unless authorized in writing by the Construction Manager, do not use water to settle backfill material in trenches adjacent to structures.

B. Safeguard and maintain conflicting utilities shown on the Contract Drawings, including overhead wires and cables and their supporting poles, whether or not they are inside or outside the trench.
1. If a conflicting utility not shown on the Contract Drawings is discovered during the course of the Work, notify the Construction Manager as soon as possible.
a. The Construction Manager will negotiate to have the owner of the conflicting utility relocate it, have others relocate the utility, change the alignment or grade of the trench to avoid the conflict, or declare the work to resolve the conflict as extra work.
2. Provide permanent pipe supports for sewer, water, and other utility lines where shown on the Contract Drawings and at other locations as deemed necessary by the Construction Manager.

a. Provide permanent pipe supports in accordance with the details shown on the Contract Drawings and local regulations.

3. Adequately support electronic, telephonic, electrical, oil, and gas lines encountered; and avoid damaging plastic pipe, pipe-way, and conduits during foundation preparation, bedding placement and backfilling operations.
   a. Support plastic pipe and electrical conduit continuously along the bottom of the pipe or conduit.
   b. Support metal pipe and electrical conduit either continuously or suspend the pipe or conduit from nylon webbing spaced at intervals not more than 10 feet apart.

C. Unless otherwise indicated in the Contract Documents, maintain all underground and overhead utilities in continuous service throughout the duration of the Contract, and take responsibility and accept liability for damages or interruptions of service caused by the construction.
   1. If a utility or appurtenance is to be temporarily or permanently relocated or shut down, the Contractor is responsible for making the necessary arrangements and agreements with the owner of the utility and its reconstruction at no increase in the Contract Price.
      a. Reconstruct the utility or appurtenance and the property to its previous condition or better as soon as possible.
      b. The relocation or shutdown and restoration cycle is subject to inspection and approval by both the Construction Manager and the owner of the utility.

D. Protect adjacent areas from damage resulting from installation, erection, or application of the Work.
   1. Protect the Work of other trades, whether being coated or not, against damage from painting and coating operations.
   2. Take the necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

3.5 REPAIR/RESTORATION

A. At the conclusion of construction, remove temporary survey points no longer required for the progression of the Work or other contracts.

B. Upon completion of the Work, remove construction tools, apparatus, equipment, unused materials and supplies, construction plant, temporary facilities, and personnel from the Site.

3.6 RE-INSTALLATION

A. Re-install survey points removed to facilitate demolition or construction activities.

3.7 CLOSEOUT ACTIVITIES

A. Survey Field Books:
   1. Generate, maintain, and preserve survey field books, electronic files, and stakeout data used to record survey data until Final Acceptance of the Work.
      a. At Final Acceptance of the Work, have the registered Surveyor or Construction Manager sign and seal the record of survey or the survey field books and stakeout

data, and submit them to the Construction Manager in accordance with the requirements of Metro-North.

b. The survey field books and stakeout data will become the property of the Metro-North.

2. Allow the Construction Manager access to the survey field books and stakeout data upon request during the course of the work.

3.8 PROTECTION

A. Control Monuments:

1. Protect horizontal and vertical control monuments previously established and indicated on the Contract Drawings.

END OF SECTION

SECTION 01 71 13

MOBILIZATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Mobilization and preparatory work includes:

1. Mobilization of all construction equipment, materials, supplies, appurtenances and the like, manned and ready for commencing and continuing the Work.

2. The subsequent demobilization and removal from the site of said equipment, appurtenances, and the like upon completion of the Work.

3. Setting up of necessary general plant, including shops, storage areas, office and such sanitary and other facilities as are required by local or State Law or regulation.

4. Assembly and delivery to the site of general plant, equipment, materials and supplies necessary for the prosecution of the Work that is not intended to be incorporated in the Work.

5. The clearing off and preparation of the field office areas.

6. The complete assembly, in working order, of equipment necessary to perform the required work.

7. Personnel services required prior to commencing actual work.

8. Providing necessary bonds, insurance and prefinancing, as required.

9. All other preparatory work required to enable commencement of the actual work on construction items.

1.02 SUBMITTALS

A. Submit within 10 working days after the date of Award, a layout of the proposed general plant site including fences, roads, buildings and storage areas for the Engineer's approval.

1.03 MEASUREMENT AND PAYMENT

A. The line item price for mobilization, as required in the "Contract Terms and Conditions", Article 3.03 - Detailed Cost Breakdown for Lump Sum Items, shall not exceed 4 percent of the Gross Sum Bid.

B. Payment will be made progressively, up to 90 percent for the line item price for mobilization as agreed to in accordance with the “Contract Terms and Conditions,” Article 3.03. The payment will be made in the form of three (3) equal monthly payments. The first payment shall be made thirty (30) calendar days after the Design-Builder begins work. Subsequent payments will be made during each of the succeeding months. The final ten (10) percent will be paid at completion of demobilization, see article 1.01A.2.

C. Partial payments may be reduced by an amount determined by the Engineer if, in his

determination, any of the following conditions apply:

1. The plant and equipment at the site are insufficient or are not suitable for the performance of the work.

2. The plant and equipment brought on the project are not being utilized or sufficiently utilized for prosecution of the work.

3. The plant and equipment brought on the project and committed to the work are removed from the project without permission of the Engineer.

D. In the event of a reduction in partial payments as provided herein, the remainder of the partial payments which are unpaid at the date of such reduction, will be paid with subsequent progress payments as and when the conditions stated are rectified as specified by the Engineer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Such materials as required for mobilization and that are not to be part of the completed Contract shall be as determined by the Design-Builder, except that they shall conform to any pertinent local or State Law, regulation or code.

2.02 PLANT AND EQUIPMENT

A. General plant and equipment shall be of the capacity, type, quality, function and in the quantity necessary for the timely prosecution of the work.

PART 3 - EXECUTION

3.01 GENERAL

A. General plant, equipment, materials, supplies, temporary buildings, facilities and other items necessary for mobilization shall be available at the work site at the time they are to be built, used, installed or operated.

B. The work required to provide the above facilities and service for mobilization shall be done in a safe and workmanlike manner and shall conform with any pertinent local or State Law, regulation or code. Good housekeeping consistent with safety shall be maintained.

3.02 PLANT

A. General plant location shall be approved by the Engineer, appropriately close to the portions of the work for which it will be used. The general plant, including equipment and personnel, shall have sufficient capacity, in the opinion of the Engineer, to permit a rate of progress which will ensure completion of the work within the time stipulated in the Contract. The Engineer shall have the right to reject general plant and apparatus which are, in his opinion, unsafe, improper, or inadequate. Rejected general plant and apparatus shall be brought to acceptable condition, or shall be removed from the job site.

3.03 DEMOBILIZATION

A. Upon completion of the work, remove general plant, equipment, materials, supplies, temporary buildings, facilities and other items necessary for mobilization, and leave area broom clean. The final 10% will be paid upon completion.

END OF SECTION

SECTION 01 71 13

MOBILIZATION

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SECTION 01 71 23 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 DESCRIPTION:

The Work specified in this Section shall include:

A. Providing for field engineering services required for the Work:

1. Survey work required in execution of the Project.

2. Civil, structural or other professional engineering services specified, or required to execute Contractor's construction methods.

B. The Contractor shall survey the site and provide the Engineer with drawings that indicate primary horizontal and vertical control monuments. Damaged and destroyed primary control monuments shall be replaced with new monuments at the expense of the Contractor.

1. Coordinate employees' and subcontractors' activities to that degree, which will either eliminate or minimize interference.

2. Remove obstructions from lines of sight when requested by the Engineer.

3. Temporarily cease activities which create hazards to survey personnel.

C. The Contractor shall preserve field books and stakeout data until one (1) year after Final Acceptance of the Work. Comply with requests by the Engineer for field books and stakeout data relating to claims against Metro-North by the Contractor based upon unforeseen site conditions or design conflicts and claims by Metro-North against the Contractor for defective work or breach of warranty of Work.

1.2 QUALITY ASSURANCE

A. The Contractor shall employ a survey crew, which includes a Surveyor licensed in the State of New York, for the required survey work.

B. The Contractor shall employ a Registered Professional Engineer of the discipline required for the specific service, licensed in the State of New York.

1.3 SUBMITTALS

The Contractor shall submit:

A. Name and address of Professional Engineer and Licensed Surveyor to the Engineer.

B. On request of the Engineer, submit documentation to verify accuracy of field engineering work.

C. Certificate signed by registered engineer or surveyor certifying that elevations and locations of improvements are in conformance, or nonconformance, with Contract Drawings.

D. Records:
   1. Maintain a complete, accurate log of all control and survey work as it progresses.
   2. On completion of major site improvements, prepare and submit a certified survey showing all dimensions, locations, angles and elevations of construction.

1.4 SURVEY REFERENCE POINTS

A. Existing basic horizontal and vertical control points for the Work are those designated on drawings.

B. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.
   1. Make no changes or relocations without prior written notice to the Engineer.
   2. Report to the Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
   3. Require surveyor to replace Project control points which may be lost or destroyed. Establish replacements based on original survey control.

C. Reestablish initial control points if missing at the start of Work, or destroyed by Metro-North during the trackwork, at no additional cost to Metro-North.

PART 2 - PART 2 - PRODUCTS

Not Used

PART 3 - PART 3 - EXECUTION

3.1 SURVEY CREW

A. The Contractor shall be required to have a survey crew in his employ to perform all survey layout necessary to construct the project in accordance with the Contract Documents.

3.2 LAYOUT OF WORK

A. Reference points shown on the Contract Drawings have been established in the field to enable the Contractor to proceed with the work.

B. Lay out the work from baselines and benchmarks, and using the working points, indicated on the drawings and make all measurements in reference thereto. Furnish all stakes, templates, platforms, equipment, tools, and materials, and labor as may be required in laying out any part of the work from the baselines and benchmarks established by the Contract Documents. Perform the work to such lines and grades as are shown on the contract drawings.

C. It shall be the responsibility of the Contractor to maintain and preserve all stakes and other marks until authorized by the Engineer to remove them. If such marks are destroyed by the Contractor or through his negligence, prior to their authorized removal, they may be replaced by the Engineer at their discretion. The expense of replacement will be deducted from any amounts due or to become due the Contractor.

END OF SECTION

SECTION 01 71 33 - PROTECTION OF WORK AND PROPERTY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section specifies protection of existing facilities and property during installation of new improvements.

1.2 PUBLIC AND PRIVATE PROPERTY

A. The Contractor shall comply with the requirements regarding protection of public and private utilities as specified herein.

B. The Contractor shall protect all shrubs, trees, fences, sidewalks, driveways, or private property crossed by or adjacent to Contract operations. The Contractor shall protect all trees and vegetation against unnecessary cutting, breaking or skinning of roots, and skinning or bruising of bark. Any damage to trees and shrubs shall be repaired and restored by Contractor employed tree surgeons at no cost to Metro-North. No trees shall be cut down without the approval of the Engineer.

C. The Contractor shall be responsible for all damage to buildings, streets, fences, traffic signs and signals, ditches, walls, culverts, utilities, barricades, lights, lock structures, or other property not scheduled for demolition caused by the work, whether such damage be at or adjacent to the site of the work or caused by transporting or hauling to or from the work site. The Contractor shall repair, replace, or arrange for the repair or replacement of all such damage to the satisfaction of MNR. Any material damaged by the Contractor's operations shall be replaced at no cost to Metro-North, with new material.

1.3 LOCATION OF EXISTING FACILITIES

A. The Contractor shall contact all utility companies and departments having underground facilities within the construction and easement areas and request they locate and mark their utilities in advance of construction in accordance with New York State Industrial Code 53. This shall be initiated within thirty (30) calendar days after Notice of Award.

B. The Contractor's efforts in locating existing underground utilities shall be coordinated with the Contractor's construction layout. The Contractor and the Engineer shall review the locations of existing utilities in relation to the new construction and resolve any conflicts with proposed new construction.

C. The Contractor shall, if so directed by the Engineer or if required to protect the utilities, excavate and expose existing utilities to determine their locations and elevations prior to the start of construction.

D. The Contractor shall be required to maintain utility mark-outs for the duration of the contract.

1.4 RESTORATION OF MISCELLANEOUS SURFACE FACILITIES

A. During construction operations of the Contractor, certain areas may be disturbed or otherwise damaged. The restoration of these areas shall be a part of the work required of the Contractor and shall be made at no additional cost to Metro-North. Verification shall be made by before and after photos taken by the Contractor. In the event of a conflict the Engineer shall have the final decision.

1.5 PROTECTION OF EXISTING STRUCTURES

A. The Contractor shall exercise every precaution to see that no damage is done to any existing structures due to his operations. Should any existing structures be damaged by or through any of the Contractor's operations, such injury or damage shall be replaced or repaired immediately in a matter satisfactory to the Engineer, at the Contractor's expense.

B. When welding or burning operations are taking place the Contractor shall provide a fire watch employee(s) with the necessary equipment to extinguish fires. Any painted steel damaged by welding or burning shall be touched-up to the satisfaction of the Engineer.

1.6 CARE OF EXISTING FACILITIES

A. All existing live sewers and water mains shall remain in service at all times. Adequate provision shall be made for disposal of existing sewage flow if any existing sewers are damaged or disturbed. Any damage to the existing sewer system shall be repaired to a condition equal to or better than that existing prior to the damage, with the costs of all repair work performed to be borne by the Contractor. All such work, if done by the Contractor, shall not be backfilled until approval of the work is granted by the Engineer.

B. The Contractor shall observe and investigate the presence of any electrical lines, poles, guys, and guy anchors that might impinge on the Contractor's work whether overhead or underground and shall consult with and rely on the information given by utility owners and operators to determine the extent of any hazard and remedial measures required. At no time shall Contractor's personnel or equipment approach closer than 10 feet to any energized primary conductors. Any required relocation/rerouting of primary conductors, poles, guys and guy anchors shall be arranged for and paid for by the Contractor.

C. The Contractor shall not perform any digging near utility lines without the direct observation of the Engineer.

D. Fire and Emergency Access: Access for firefighting and emergency equipment shall be maintained at all times.

1.7 TEMPORARY FENCE

A. The Contractor shall erect temporary fencing or barricades to protect its work area. The Contractor shall also erect and maintain temporary fencing or other facilities as required

maintaining the security of existing fenced areas. Temporary fencing on facilities shall remain in place until the fencing is no longer required, as determined by the Engineer. Also, the Contractor is responsible for placement of a barrier between the passenger and work areas on the platforms.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 73 29 - CUTTING, PATCHING, AND REMOVALS

PART 1 - GENERAL

1.1 SUMMARY

A. DESCRIPTION: Contractor shall do all cutting and patching, painting and finishing of existing work which is disturbed while performing the work. Contractor shall be responsible for restoring new work, which is damaged. All work shall be restored to provide a new appearance and to be structurally sound. The work shall be done be competent workmen skilled in the trade required be the restoration.

1.2 QUALITY ASSURANCE

A. GENERAL:
   1. Refer to Section 01 45 00 Quality Assurance

PART 2 - PRODUCTS

2.1 Submit all patch materials and procedures for approval prior to the start of this work.

2.2 Submit a removal plan for review by the Engineer.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. EXAMINATION: If unforeseen obstructions are encountered, take precautions necessary to prevent damage and obtain instructions from MNR before proceeding with the work.

3.2 PREPARATION

A. Provide temporary shoring and other supports necessary to prevent settlement or other damage to existing construction, which is to remain.

B. Prepare existing surfaces properly to receive, and where required, to bond with the work.

3.3 REMOVAL, CUTTING, ALTERING

A. A. In addition to items indicated on Drawings to be removed, remove temporary construction superseded by the work unless otherwise instructed by the Engineer.

B. Remove and alter existing construction as required to install and connect the work to adjacent construction in an approved manner.

C. Cut and alter existing materials as required to perform the work. Limit the cutting to the smallest amount necessary. Core drill around holes and sawcut other openings where possible.

D. Perform cutting, drilling, and removals in a manner, which will prevent damage to construction which is to remain.

3.4 PATCHING

A. GENERAL: Patch existing construction and finishes defaced, damaged, or left incomplete due to alterations or removals. Patching, except as otherwise indicated, shall be limited to the areas, which have been cut or altered; match materials and quality of area patched, as approved by the Engineer.

END OF SECTION

SECTION 01 74 00 - CLEANING AND WASTE MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and other Division 01 Specification Sections, apply to the Work of this Section.

1.2 RELATED SECTIONS

A. Section 01 31 00 - Project Management and Coordination.

B. Section 01 33 00 - Submittal Procedures.

C. Section 01 43 00 - Quality Assurance.

D. Section 01 50 00 - Temporary Facilities and Controls.

E. Section 01 74 19 - Construction Waste Management and Disposal

F. Section 02 82 00 -Lead-Containing Materials

G. Section 02 82 13 - Asbestos Abatement

1.3 SUMMARY

A. This Section specifies requirements for:
   1. Maintaining a clean, orderly, and hazard-free work Site.
   2. Managing waste during construction operations.
      a. Manage non-hazardous construction and demolition waste and materials.
      b. Manage hazardous construction and demolition waste and materials.
      c. Protect the environment, both onsite and offsite.
      d. Prevent environmental pollution and damage.
   3. Performing a final cleaning prior to occupancy.

1.4 REFERENCES

A. Abbreviations and Acronyms:
   1. ACA: Ammoniacal copper arsenate, a leach-resistant waterborne wood preservative.
   2. CCA: Chromated copper arsenate, a leach-resistant waterborne wood preservative.
   3. LEED: An acronym for the Leadership in Energy and Environmental Design Green Building Rating System™, a third-party certification program administered by the United States Green Building Council (USGBC), and the nationally accepted benchmark for the design, construction, and operation of high performance green buildings.

4. MSDS: Material Safety Data Sheets.

B. Definitions:
1. Asbestos: The asbestiform varieties of serpentine (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite, anthophyllite, and actinolite- tremolite.
2. Authority Having Jurisdiction (AHJ): Building Code officials, zoning officials, inspectors, and government and regulatory agencies given the authority to protect the public's health, safety, and welfare.
3. Clean: To remove dirt, grime, trash, debris, and similar materials to achieve a level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.
4. Polychlorinated Biphenyls (PCBs): Any chemical substance that is limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contains such substance, including, but are not limited to: dielectric fluids; solvents; oils; waste oils; heat transfer fluids; hydraulic fluids; paints or coatings; sludges; slurries; sediments; dredge spoils; soils; materials containing PCBs as a result of spills; and other chemical substances or combinations of substances, including impurities and byproducts and any byproduct, intermediate, or impurity manufactured at any point in a process.
5. Waste: Excess or unusable construction materials, packaging materials for construction products, the products of demolition or removal, and other materials generated during the construction process but not incorporated in the Work.

C. Reference Standards:
1. ASTM International (ASTM):
   a. ASTM D5834 - Standard Guide for Source Reduction Reuse, Recycling, and Disposal of Solid and Corrugated Fiberboard (Cardboard) [*withdrawn 2003*].
   b. ASTM D5509 - Standard Practice for Exposing Plastics to a Simulated Compost Environment [*withdrawn 2002*].
   c. ASTM D6002 - Standard Guide for Assessing the Compostability of Environmentally Degradable Plastics [*withdrawn*].
   d. ASTM E1609 - Standard Guide for Development and Implementation of a Pollution Prevention Program [*withdrawn 2010*].
   e. ASTM E1971 - Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings.
2. New York State Government:
   a. New York Code, Rules and Regulations (NYCRR):
      1) The New York State Department of Environmental Conservation (DEC):
         a) 6 NYCRR Part 638 - Green Building Tax Credit.
   b. New York State Energy Research and Development Authority (NYSERDA):
      1) New York State Executive Order No. 111 – "Green and Clean" State Buildings and Vehicles Guidelines.
   c. New York State Tax Law:
      1) Section 19 Green Building Tax Credit.
3. United States Government:
   a. Department of Labor:
      1) Occupational Safety and Health Administration (OSHA):
         a) 29 CFR 1910 Occupational Health and Safety Standards.
         b) 29 CFR 1926 Safety and Health Regulations for Construction.
4. United States Green Building Council (USGBC):
   a. LEED 2009 for New Construction and Major Renovations, http://www.usgbc.org.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate clean-up operations with the completion of the Work of other Specification Sections.
   2. Provide on-site instruction of staff regarding appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at appropriate stages of the Contract.

B. Pre-Installation Meetings:
   1. At the Pre-Construction Conference specified under Section 01 31 00, Project Management and Coordination, discuss the proposed Waste Management Plan specified herein to develop a mutual understanding relative to the details of environmental protection and waste management required for this Contract.
   2. Prior to performing major demolition work as part of this Contract, discuss waste management issues related to the demolition activities at pre- demolition meetings which must be scheduled to discuss demolition, environmental, and waste management issues.

1.6 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Comply with the requirements specified in New York State Executive Order No. 111.

B. Qualifications:
   1. Testing and Inspection Agency's Qualifications:
      a. Employ an independent Testing and Inspection Agency having the qualifications specified in Section 01 43 00, Quality Requirements, and the following additional qualifications:
         1) Capable of performing the reviews, inspections, and testing required by this Section to verify compliance with the Contract Documents; including but not limited to the following:
            a) Inspecting, sampling, and testing proposed materials and production as required by the Metro-North Engineer.
            b) Capable of securing and testing samples of materials from stockpiles during the course of the work.
      b. Submit the qualifications of the Testing and Inspection Agency to the Metro-North Engineer for approval.
   2. Janitorial Firm Qualifications:
      a. Employ an experienced janitorial firm having at least 3 years demonstrated experience performing cleaning functions similar in scope to those required of it under this Contract.
      b. Submit the qualifications of the janitorial firm to the Metro-North Engineer for approval.
   3. Waste Removal Firm Qualifications:
      a. Employ a waste removal firm, licensed by the local jurisdiction to remove waste from within the jurisdiction, and having at least 5 years demonstrated experience performing waste removal functions similar in scope to those required under this Contract.
      b. Submit the qualifications of the waste removal firm to the Metro-North Engineer for approval.

1.7 SUBMITTALS

A. Action Submittals:
1. Submit the following to the Metro-North Engineer for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
   a. Product Data:
      1) Cleaning products.
   b. Special Procedure Submittals:
      1) Waste Management Plan.
   c. Qualification Statements:
      1) Testing and Inspection Agency's qualifications.
      2) Janitorial firm's qualifications.
      3) Waste removal firm's qualifications.

B. Informational Submittals:
1. Submit the following to the Metro-North Engineer for information in accordance with the requirements of Section 01 33 00, Submittal Procedures:
   a. Manufacturer's Instructions:
      1) Cleaning product manufacturer's instructions.
   b. Site Quality Control Submittals:
      1) Waste and debris testing test reports.

C. Closeout Submittals:
1. Submit the following to the Metro-North Engineer in accordance with the requirements of Metro-North:
   a. Sustainable Design Closeout Documentation:
      1) Summary of Solid Waste Disposal and Diversion forms.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:
1. Recycling or Reuse Facility Requirements:
   a. Arrange with the appropriate recycling or reuse facility for collection by or delivery to their facility.
      1) Transport recyclable materials to recycling facilities and reusable materials to reuse facilities for further processing in accordance with the requirements of the recycling or reuse facility.
      2) Deliver materials in accordance with recycling or reuse facility requirements such as, but not limited to, being free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
   b. The landfill facility has to be a firm on the Metro-North approved list.
2. Hazardous Waste Landfill Records:
   a. Submit documentation indicating the receipt and acceptance of the hazardous wastes by a landfill facility licensed to accept hazardous wastes for the record.

B. Storage and Handling Requirements:
1. Handling:
   a. Clean materials that are contaminated prior to placing them in collection containers.

b. Handle hazardous materials and waste in accordance with the requirements specified in Section 02 82 13, Asbestos Abatement, Section 02 82 00, Lead-Containing Materials, and with the applicable Federal, State, and local regulations.

2. Do not allow waste material to be dropped or thrown from structures.
3. Hazardous Waste and Hazardous Materials:
   a. Handle hazardous waste and hazardous materials in accordance with applicable regulations.

C. Storage and Protection:
1. Provide rodent-proof, covered refuse containers for non-construction refuse such as food, food waste, wrappers, and packaging materials to minimize attracting mammalian, reptilian, or insect pests.
   a. Empty the refuse containers daily, or more frequently as necessary to prevent the refuse from overflowing the containers.
   b. Remove the accumulated contents of the refuse containers from the Site daily.
2. Separate, store, protect, and handle recyclable and salvageable waste products identified at the Site in a way that maximizes recyclability and salvageability.
   a. Provide clearly and appropriately identified containers, bins, and storage areas to facilitate effective waste management.
   b. Provide non-hazardous barriers and enclosures around recyclable material storage areas.
   c. Locate the containers, bins, and storage areas out of the way of construction traffic, but where adequate space exists for pick-up and delivery of waste materials by subcontractors and others.
   d. Clean contaminated materials prior to placing them in collection containers.
   e. Keep recycling and waste bin areas clean and neat.
3. Store volatile wastes in covered metal safety containers having appropriate warning and identification labels.

D. Packaging Waste Management:
1. Remove shipping, blocking, and bracing materials.
   a. Remove the loose packing materials and protective wrapping such as shrink-wrap, wood crating, and packing from products as required.
2. Dispose of packaging waste in accordance with the requirements of the Waste Management Plan specified herein.

1.9 SITE CONDITIONS

A. Ambient Conditions:
1. If volatile and/or noxious substances are being used in spaces that are not naturally ventilated, provide artificial ventilation.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. Regulatory Requirements:
1. New York State Executive Order No. 111:

a. Comply with the requirements specified in New York State Executive Order No. 111.
   1) Complete the LEED credits specified in LEED 2009 for New Construction and Major Renovations that would be required to qualify the Project for LEED Silver Level certification.
   2) Comply with the requirements specified in 6 NYCRR Part 638.
   3) Comply with the requirements specified in New York State Green Building Tax Credit regulations.

2. Hazardous Waste and Hazardous Materials:
   a. Handle hazardous waste and hazardous materials in accordance with applicable regulations.
   b. Only disposal sites and transporters on the Metro-North Department of Environmental Compliance and Services approved list can be used. Metro-North reserves the right to arrange for transport and disposal of the materials outside the Contract.
3. Metro-North:
   a. Comply with the requirements specified in Metro-North Capital Procedures and Guidelines: Environmental Guidelines H.48.
4. Comply with the requirements of the applicable local and State dust control ordinances.
5. During the course of the Work, comply with the OSHA requirements specified in 29 CFR 1910 and 29 CFR 1926, paying special attention to those regarding hazardous and toxic materials and substances, ventilation and other environmental controls, and disposal of waste materials.
6. See Specification 01 74 19 Construction Waste Management and Disposal for additional requirements.

B. Sustainability Requirements:
   1. See PDC Appendix I for sustainability requirements.

2.2 MATERIALS

A. Cleaning Materials:
   1. Furnish and apply the type of cleaning materials recommended by the manufacturer of the surfaces to be cleaned.
   2. Furnish non-hazardous and biodegradable cleaning materials whenever possible.
   3. Submit Product Data for each cleaning product furnished for use to the Metro-North Engineer for approval.
   4. Submit manufacturer's instructions for each cleaning product furnished for use to the Metro-North Engineer for information.

B. Dust Suppressants:
   1. Furnish environmentally safe, dust suppressants as specified in Section 01 50 00, Temporary Facilities and Controls.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Visit the Site to verify conditions at the Site prior to beginning the other onsite Work of this Contract.
   2. Notify the Metro-North Engineer of unexpected conditions discovered by the on-site visit prior to beginning the other on-site Work for this Contract.

B. Evaluation and Assessment:
   1. Identify trash and other items at the Site which may need to be removed or abandoned in place prior to beginning the other Work of this Contract.
   2. Identify materials which must be tested for hazardous content prior to demolition and removal operations.
   3. Identify areas where waste receptacles and access corridors thereto may be located for the duration of this Contract.

3.2 PREPARATION

A. Protection of In-Place Conditions:
   1. Do not allow dust and other contaminants resulting from cleaning operations to precipitate onto newly painted surfaces and freshly placed concrete.
   2. Avoid disturbing the natural weathering of exterior surfaces, unless otherwise indicated.

B. Surface Preparation:
   1. Seal cracks and openings in substrates, and then clean the substrate surfaces prior to applying the next material or substance to the substrate.

C. Demolition / Removal:
   1. Remove demolition debris in accordance with the approved Waste Management Plan prior to applying, constructing, erecting, or installing new Work in the affected areas.
      a. Remove demolition debris and abandoned items from alteration areas.

3.3 REPAIR/RESTORATION

A. Repair, or remove and replace, items that are damaged.
   1. Replace broken glass.
   2. Touch-up damaged surfaces to the specified finish or to match the overall finish of the equipment or system component.

3.4 SITE QUALITY CONTROL

A. Site Tests:
   1. Waste and Debris Testing for Hazardous Materials:
      a. Have the Testing and Inspection Agency test solid waste and debris having the potential of being classified as hazardous waste at the point of generation of the

waste stream to determine if special procedures for handling and disposing of it are required.

1) Material Safety Data Sheets (MSDS) are by themselves insufficient documentation to make this determination.

b. Submit copies of the test reports for the solid waste and debris testing to the Metro-North Engineer for information.

B. Site Inspections:

1. At least once a week, inspect the Site to verify that progress cleaning is maintaining the Site in a safe and healthy condition, and that the Waste Management Plan is being properly implemented.
2. Inspect the Site prior to the "final" inspection of the Work by the Metro-North Engineer to determine if it is properly cleaned and ready for the Metro-North Engineer's inspection and use by the Owner.

C. Non-Conforming Work:

1. If Site tests indicate solid waste and debris is hazardous waste, use the special hazardous waste procedures for handling and disposing this material.
2. If Site inspections indicate the Site is not maintained in a safe and healthy condition, the Waste Management Plan is not being properly implemented, or the Site is not properly cleaned and ready for the "final" inspection of the Work by the Metro-North Engineer and use by the Owner, take remedial action to correct this situation.

3.5 CLEANING

A. Construction Materials Cleaning:

1. Prior to incorporating construction materials into the Work, clean them as necessary.
   a. Provide special cleaning as specified in individual Specification Sections, or as required by manufacturer's instructions.
2. At the completion of the Work of each trade, clean surfaces and make the surfaces ready for the Work of successive trades.

B. Progress Cleaning:

1. During the construction of the Work, clean the Site every workday or more often when directed to do so by the Metro-North Engineer.
2. Prior to starting to finish interior surfaces, broom, vacuum, or otherwise clean the affected interior areas.
3. Keep the equipment, structures, grounds, and other areas on and adjacent to the Site free from accumulations of waste materials and trash resulting from the Contractor's construction and demolition operations.
   a. Once materials at the Site become unfit for use in the Contract Work, collect these waste materials, remove them from the Site, and legally dispose of them.
      1) Place collected waste materials in metal containers or dumpsters.
      2) Remove volatile wastes from the Site daily.
   b. Maintain field trailers, buildings, and other facilities used to prosecute the Work neat and clear of refuse, rubbish, and debris accumulations to the satisfaction of the Metro-North Engineer.
   c. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other spaces to be enclosed prior to enclosing the spaces.

d. Remove debris from elevated portions of the building(s) by employing a chute, hoist, or other device that will convey the debris to grade level in a controlled descent.
   1) If allowed by the Owner, elevators, stairs, or building entries may be used.

4. Control airborne dust and particles that may become a nuisance to the public or are deleterious to the performance of the Work.
   a. Broom and vacuum clean interior areas to eliminate dust.
   b. To suppress dust, periodically wet the soil in excavation and backfill work zones, and periodically wet dirt roads.
   c. When airborne particles are visible, and the Metro-North Engineer orders application of a topical dust suppressant, apply the material the same day.
5. During construction of the Work, keep streets and pedestrian walkways clean and free of trash and construction debris.
   a. Keep paved roadways, streets, and pedestrian walkways, both on and adjacent to the Site, clean.
      1) Prevent construction equipment from tracking soil, dirt, and debris onto public roadways and right-of-way.
         a) Properly clean construction equipment before allowing it to leave the Site.
         b) Construct construction entrances in accordance with the requirements of Section 01 50 00, Temporary Facilities and Controls, and designed to facilitate the removal of soil and dirt from vehicles.
      2) Remove spillage resulting from hauling or construction operations along or across streets, roads, paths, and access routes.
         a) If dump trucks and other equipment are working on or adjacent to paved streets, keep the streets and adjacent pedestrian walkways clean using street sweepers or other means approved by the Metro-North Engineer.
      3) Wash local streets that are soiled from construction activity.
6. Perform the specific cleaning operations as specified in other Sections.

C. Final Cleaning:
1. After the construction work is essentially completed but preceding the “final” inspection of the Work by the Metro-North Engineer to determine if it is ready to be awarded the Certificate of Substantial Completion, clean and prepare the Site, including landscape development areas, to make it ready for the Metro-North Engineer’s inspection and use by the Owner.
   a. Inspect interior and exterior surfaces, including concealed spaces, for cleanliness in preparation for requesting Substantial Completion and Final Acceptance.
   b. At the completion of alteration work in each area, perform a final cleaning and return the space to a condition suitable for use by the Owner.
2. Perform final cleaning of the Work at times approved by the Metro-North Engineer by cleaning such surfaces or units of the Work to the normal clean condition.
   a. Comply with safety standards and governing regulations for cleaning operations.
   b. Remove dirt, dust, litter, debris, corrosion, solvents, discursive paint, stains, and extraneous markings from the facilities provided under this Contract.
   c. Clean the Site, including landscape development areas, of litter and foreign substances.
      1) Sweep paved areas to a broom-clean condition; and remove stains, petro-chemical spills and other foreign deposits.
      2) Rake grounds which are neither planted nor paved to a smooth, even textured surface.

3) Remove surplus materials, except those materials intended for maintenance.
4) Remove tools and equipment used for construction, except those to remain the Owner's property.

d. Comply with manufacturers' instructions for cleaning operations.

e. Clean exposed exterior and interior hard surfaces, including metals, masonry, stone, concrete, painted surfaces, plastics, tile, wood, special coatings, and similar surfaces to a dirt-free condition.
1) Provide final cleaning within buildings in accordance with the requirements of ASTM E 1971.
2) Clean surfaces so that they are free of dust, stains, films, and similar noticeable distracting substances.
a) Vacuum-clean areas where appropriate, such as carpeted and soft surfaces.
b) Remove spots, stains, smears, dirt, dust, litter, debris, hand prints, corrosion, solvents, discursive paint, extraneous markings, petro-chemical spills, and other defacements of every sort, including those caused by vandals, using commercial cleaning products wherever necessary.
c) Clean mirrors, door and window glass, doors, opening frames, grilles, trim, exposed non-ferrous metal surfaces, floor coverings, light fixtures and plates, plumbing fixtures and trim, and other finish surfaces throughout the facility.
(1) Comply with the manufacturer's instructions for cleaning their products.
(2) Clean fixtures and equipment to achieve a sanitary condition using cleaning materials appropriate to the surfaces and materials being cleaned.
d) Clean and polish transparent and glossy surfaces.
(1) Restore reflective surfaces to their original reflective condition.
e) Sweep paved areas to a broom-clean condition.
f) Rake grounds that are neither planted nor paved to a smooth, even textured surface.
3) Hose and scrub clean concrete flatwork, exposed vertical surfaces of concrete and masonry, and pavement and paved walks.
4) Remove mortar droppings from concrete slabs and pavement wherever they occur.
5) Wipe mechanical and electrical equipment surfaces clean, removing excess lubrication and other grimy substances.
6) Clean or replace dirty filters of operating equipment.

f. Clean debris from roofs, gutters, downspouts, and drainage systems.
1) Insure that drainage systems are free and clear of debris and other obstructions.

3. Remove surplus materials, except those intended for maintenance.
4. Remove tools and equipment used during construction, except for the Owner's property.
a. Remove temporary protective devices and facilities, such as signs or barricades, previously installed to protect completed Work.
5. Remove construction and demolition waste and unused materials, dunnage, loose rock and stone, excess earth, and other debris and foreign substances resulting from the Work.
6. Additional examples of final cleaning include, but are not limited to, the following:
a. Remove temporary labels that are not required as permanent identification.

1) Remove detachable labels and tags, and file them with the manufacturer's specifications of that specific item for the Owner's record.

b. Remove strippable film and other protective coverings at the time of Substantial Completion.

c. Clean materials such as mirrors and window/door glass to remove noticeable dirt, stains, films, and smears.
   1) Replace broken glass.

d. Clean exposed exterior and interior hard-surfaces, including metals, masonry, stone, concrete, painted surfaces, plastics, tile, wood, special coatings, and similar surfaces, to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances.
   1) Except as otherwise indicated, avoid the disturbance of natural weathering of exterior surfaces.
   2) Restore soiled reflective surfaces to the original reflective condition.

e. Wipe the surfaces of mechanical and electrical equipment clean; and remove excess lubrication and other deleterious substances.
   1) Touch-up damaged surfaces to match with the overall finish of the equipment/system component.

D. Removal of Protection:
   1. Except as otherwise indicated or requested by the Metro-North Engineer, remove temporary protective devices and facilities such as warning, regulatory, or guide signs which were installed during the course of the Work to protect previously completed Work during the remainder of the construction period.

E. Waste Management:
   1. See Specification section 01 74 19 Construction Waste Management and Disposal.

3.6 PROTECTION

A. Limiting Exposures:
   1. Supervise construction operations to assure that no part of the completed or in-progress construction is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
   2. Apply protective coverings where required to assure protection from damage or deterioration until Substantial Completion is accepted.
      a. Protect completed Work from becoming fouled by overspray, dirt, dust, or debris.
   3. Remove protective coverings when they are no longer needed.
   4. Reuse or recycle plastic coverings if possible.

B. Remove or secure loose material on open decks and other exposed surfaces at the end of each workday, or more often if required, to maintain a hazard- free Site.
   1. Secure loose material in a manner that will prevent its dislodgement by wind or other forces.

3.7 MAINTENANCE

A. Maintenance Service:

1. Employ an experienced janitorial firm to provide cleaning services for field trailers, buildings, and other facilities, and for restocking consumable janitorial supplies required to maintain the Site in a clean and sanitary condition, during the life of this Contract.
2. Employ an experienced waste removal firm to remove refuse, rubbish, and debris accumulations to maintain the Site in a neat condition during the life of this Contract.

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 – GENERAL

1.01 SECTION INCLUDES:

A. In accordance with NYS Executive Order 4, Metro-North's solid waste management priorities include reducing the generation of solid waste, reusing materials, and recycling materials that cannot be reused. In accordance with the requirements for a large quantity generator (LQG) and a small quantity generator (SQG) of hazardous waste, Metro-North's Hazardous Waste Minimization Plan has been developed to reduce the amount of hazardous waste generated as part of railroad operations.

B. Requirements for managing the material waste generated during construction site activities.

1.02 RELATED SECTIONS:

A. 01_33_60 Safety, Health and Environmental Control

B. 01_35_43 Environmental Protection

C. 02_61_00 Sampling, Testing, Handling, Loading, Removal, &Disposal of Soils

D. 02_82_00 Asbestos Abatement

E. 02_83_00 Lead Abatement

F. 02_84_30 Universal Waste and Miscellaneous Hazardous Materials

1.03 SUBMITTALS:

A. Waste Management Plan: Within thirty (30) calendar days after receipt of Notice of Award, the Contractor shall submit a Waste Management Plan for approval by the Engineer. The Plan shall detail all measures and procedures to be undertaken by the Contractor to manage wastes, including procedures to properly identify, characterize, store, label, containerize, transport, and dispose of wastes (solid, construction and demolition debris (C&D), hazardous, universal) generated during site activities. Where applicable and feasible, the Contractor shall attempt to maximize the quantity of waste material that is diverted from landfills through salvage, reuse or recycling. See Section 3.04 for the Plan's requirements.

B. Waste Management Calculator/Log: Upon commencing significant construction operations and continuing through project completion, the Contractor shall complete and submit a Waste Management Calculator/te Log). The Waste Management Calculator shall be submitted monthly and annually. The monthly log shall report on the preceding month's waste generation. The annual log shall report on the preceding year's waste generation; aggregating and summarizing the waste generated from January through December of the preceding year. See Section 3.05 for the Report's requirements.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

3.01 GENERAL

A. Waste material transporters and disposal sites for off-site disposal of waste material shall be approved by the Engineer prior to use by the Contractor. The Engineer has the right to disapprove any transporter or disposal site that does not meet his approval and to request the Contractor to propose alternate transporters and or disposal sites. Such requests shall not be used by the Contractor as a basis for a delay claim.

B. The Contractor shall utilize transportation and disposal facilities from Metro-North Railroad's list of approved facilities. See *"Metro-North Railroad Environmental Compliance & Services Approved Waste Management Consultants, Disposal Facilities, Transporters and Laboratories".* With the exception of wastes categorized as clean Municipal Refuse (i.e. Household Garbage) and Construction and Demolition Debris, all other wastes shall be transported and disposed of by a Metro-North Railroad approved waste transporter and disposal facility. Should the Contractor choose to utilize companies that have not been pre-approved by Metro-North Railroad, the Contractor shall be responsible for all costs associated with the auditing of the transporter and/or disposal facility and submittal of documentation to Metro-North for review. Any additional facilities are required to meet the same audit requirements as the approved facilities. Submittal of audit documentation does not guarantee Metro-North will approve the transporter or disposal facility for use. Any delays or expenses resulting from the audit and Contractor's submittal of documentation for alternate waste transporters or disposal facilities for Metro-North review, are non-compensable and shall be borne solely by the Contractor.

3.02 SOIL, HAZARDOUS, AND UNIVERSAL WASTE

A. Hazardous waste is defined in 40 CFR Part 261, New York State ECL Section 27-09 or 6 NYCRR Part 371 (Identification and Listing of Hazardous Waste).

B. Hazardous and dangerous waste generated within the job site shall not be moved except in accordance with Federal and State regulations. If the presence of hazardous waste is confirmed, the Metro-North Department of Environmental Compliance and Services shall be advised promptly.

C. In no event shall hazardous waste remain on the site for more than 60 days from generation. All hazardous materials and or waste are to be stored in compatible and regulated storage containers/drums. Provide the SDS to the Engineer. All materials are to placarded and stored in accordance with State and Federal regulations.

D. Copies of Weight Tickets/Bill-of-Lading and/or Waste Profile Sheets; Waste Manifests (for Hazardous Waste) must be submitted to the Engineer for authorization prior to off-site disposal.

E. Signed Originals of Weight Tickets/Bill-of-Lading and/or Waste Profile Sheets; Waste Manifests (for Hazardous Waste) are to be turned over to the Metro-North Engineer after making copies of each following each waste shipment.

Metro-North Engineer will forward each signed original to Metro-North Department of Environmental Compliance and Services.

F. When applicable, the testing, handling and disposal of waste generated from the abatement of asbestos and/or lead containing material shall comply with requirements outlined in Section 02_82_00 Asbestos Abatement and Section 02_83_00 Lead Containing Materials.

G. When applicable, the testing, handling, and disposal of miscellaneous hazardous substances and universal wastes, such as PCB's, mercury, and fluorescent lighting, shall comply with the requirements outlined in Section 02_84_30 Universal Waste and Miscellaneous Hazardous Materials.

H. When applicable, the testing, characterization, handling and disposal of excess excavated soil shall comply with requirements outlined in Section 02_61_00 Sampling, Testing, Handling, Loading, Removal, and Disposal of Soils.

3.03 WASTE MINIMIZATION

A. In accordance with Metro-North Railroad's Waste Minimization Plan, the project's goal is to salvage, re-use, or recycle at least seventy-five percent (75%) by weight of the waste generated on this project.

B. Potential strategies to minimize waste could be:

1. Use alternative techniques of waste disposal such as recycling, salvage and/or reuse that minimizes the amount of waste generated during the demolition/construction process from entering landfill disposal.

2. Prior to demolition, review for recycling, reuse and/or salvage the selective demolition of building components that can be recovered. Recoverable building components include but are not limited to the following: structural and architectural elements, bollards, fences, steel parts, stonework, utility poles, foundations and concrete pavement.

3. Implement efficient management of processes that ensure the generation of as little waste as possible due to error, inaccurate planning, breakage, spills, mishandling, contamination or other factors.

4. To the greatest extent possible, ensure that materials and equipment are delivered in packaging made of recyclable material in a reduced amount of packaging.

5. Establish a field office recycling program for paper, bottles, and cans generated by employees working on the project.

C. Provide containers for waste that is to be recycled clearly labeled as such with a list of acceptable and unacceptable materials. The list of acceptable materials must be the same as the materials to be recycled at the receiving material recovery facility or recycling processor.

D. Provide containers for waste that is to be disposed in a landfill clearly labeled as such.

E. Conduct regular visual inspections of waste handling procedures and the storage container site to ensure that wastes scheduled for recycling, salvage and reuse are not contaminated.

3.04 WASTE MANAGEMENT PLAN

A. The Contractor shall be responsible for the development and implementation of a Waste Management Plan for the project. See Metro-North's Waste Management Plan template for assistance in developing the plan. The Waste Management Plan shall be revised as necessary throughout the duration of the contract to reflect actual waste handling procedures.

B. The Waste Management Plan shall contain the following:

1. Waste handling strategy overview. Provide an overview of the means by which waste material will be gathered, stored and managed on site and transported to its final disposition. This section shall also identify strategies that will be employed to minimize waste that is sent to landfills and identify the person(s) responsible for implementation and compliance with the Plan.

2. Identification and quantifying of waste streams. Identify each type of waste stream including, but not limited to: general Construction and Demolition Debris(C&D), concrete, steel, soil, hazardous materials, salvaged material, etc. Estimate types and quantities by weight, or other pertinent unit of measure, of waste expected to be generated by the project. Calculate expected overall diversion rate from landfills.

3. If the handling of a waste stream is governed and approved through a separate submittal (for example – Lead or Asbestos Site Specific Work Plan), Contractor shall reference the separate plan in the Waste Management Plan but is not required to describe in details the handling and disposal of this waste stream in this plan.

4. Onsite waste collection. Provide description of the onsite waste collection process with drawing depicting waste container laydown and storage areas. Include type and size of containers to be used, and labeling / designation methods for each container. Describe methods used to prevent precipitation from entering and contaminated run-off from draining out of open top roll-off containers (containers shall be properly covered while on site).

5. Transportation. Describe methods used to transport wastes both on site and off site. Describe methods for collecting wastes from work areas, transportation to interim on site storage areas, and containerization methods. Identify vendors providing off site transportation of waste materials. Provide names, addresses, and telephone numbers for transporters/haulers and disposal facilities. Provide permits for transporters/haulers and disposal facilities. Affirm that transporters/haulers are permitted to haul the types of waste they will eb transporting. Provide affirmation that all wastes, with the exception of Construction and Demolition Debris (C&D), will be transported and disposed of by a Metro-North Railroad approved vendor.

6. Disposal. Identify all final disposal sites and include permits for approval. Provide names, addresses, and telephone numbers of persons to contact. Affirm that disposal facilities are permitted to accept the types of wastes they will be receiving. Identify vendors providing transportation of waste materials. Provide names, addresses, and telephone numbers for transporters/haulers and disposal facilities. Provide permits for transporters/haulers and disposal facilities. Affirm that transporters/haulers are permitted to haul the types of waste they will eb transporting. Provide affirmation that all wastes, with the exception of Construction and Demolition Debris (C&D), will be transported and disposed of by a Metro-North Railroad approved vendor.

3.05 WASTE MANAGEMENT REPORTING

A. In accordance with NYS Executive Order 4, and Metro-North's Waste Minimization Plan, solid waste management priorities include reducing the generation of solid waste, reusing materials, and recycling materials that cannot be reused. Metro-North is required to report annually on its waste reduction.

B. The Contractor shall maintain a log of all wastes generated on the project and report such utilizing Metro-North's *Waste Management Calculator*. See Metro-North's *Waste Management Calculator*. The Waste Management Calculator shall be submitted monthly and annually from project initiation through completion, and the Contractor must provide it within 48 hours of a request. In addition to the monthly logs, the Contractor shall submit an annual log. The annual log shall be submitted in January, or upon completion of the project, whichever occurs earlier, summarizing all wastes generated on the project from January through December of the preceding year.

C. The Waste Management Calculator shall contain the following information:

1. At the end of each calendar year in which the project is active, submit a progress report that details:
   - Contract Number and Project Description
   - Contractor
   - Submittal Date
   - Reporting Period,
   - Material Description (i.e. municipal garbage, construction & demolition debris, metals/steel, fluorescent bulbs, ballasts, batteries, etc.),
   - Quantities (in tons),
   - Percent Diverted from Landfill
   - On-Site Handling/Containerization Method (i.e. roll-off, drums, bags)
   - Waste Hauler/Transporters,
   - Recycling/Disposal Facilities,
   - Type of disposal in terms of salvage/re-use, recycled, or disposed to landfill.
   - Overall diversion rate for reporting period (total amount salvaged, re-used, and recycled divided by total waste generated)

2. Provide and submit with the Waste Management Calculator, all manifests, scale tickets, bills of lading, receipts issued by the transporter and disposal facility for the acceptance of waste disposed in a landfill or as issued by an approved recycling facility.

3. For salvaged materials, provide receipts for materials sold or donated to a third party.

4. For material salvaged or reused on site, provide estimated quantity calculations, measured by weight.

END OF SECTION

Metro-North Railroad Environmental Compliance & Services

Approved waste management consultants, disposal facilities, transporters, and laboratories

Waste Management Consultants

WTS, Inc. 435 North 2nd Street Lewiston, NY 14092 716-754-5400 **Capabilities:** Full service waste management firm supplying sampling and analysis, waste characterization, waste profile preparation, logistics, transport and disposal, and preparations of manifests and bills of lading		

Disposal Facilities

110 Sand and Gravel 170 Cabot Street W. Babylon, NY 11980 631-694-2822 **Capabilities:** Railroad ties, non-hazardous soil	**Advanced Greentree Landfill** 635 Toby Road Kearsey, PA 15846 814-231-1744 **Capabilities:** Landfill for non-regulated material	**AERC** 2591 Mitchell Avenue Allentown, PA 18103 610-797-7608 **Capabilities:** Universal waste and mercury recycling
Bayshore Recycling Corp. 75 Crow Mills Road PO Box 290 Keasbey, NJ 08832 732-738-6000 **Capabilities:** Non-hazardous petroleum contaminated soils	**Clean Earth of Carteret, Inc.** 24 Middlesex Road Carteret, NJ 07008 215-428-1700 **Capabilities:** Non-hazardous petroleum contaminated soil	**Clean Earth of New Castle** 94 Pyles Lane New Castle, DE 19720 302-427-6633 **Capabilities:** Non-hazardous petroleum contaminated soil

Clean Earth of North Jersey 115 Jacobus Avenue S. Kearney, NJ 07032 973-344-4004 **Capabilities:** Non-hazardous petroleum contaminated soil	**Clean Earth of Philadelphia** 3201 South 61st Street Philadelphia, PA 19153 215-734-1400 **Capabilities:** Non-hazardous petroleum contaminated soil	**Clean Harbors** 761 Middle Street Bristol, CT 06010 860-583-8917 **Capabilities:** Hazardous and non-hazardous waste disposal.
Clean Harbors of Braintree Inc. 1 Hill Avenue Braintree, MA 02184 781-380-7100 **Capabilities:** Hazardous and non-hazardous waste disposal.	**Clean Harbors of Deer Park TX** 2027 Independence Pkwy South LaPorte, TX 77571 207-450-9695 **Capabilities:** Hazardous and non-hazardous waste disposal.	**Clean Harbors of El Dorado LLC** 309 American Circle Union El Dorado, AR 71730 207-450-9695 **Capabilities:** Hazardous Incineration
Clean Harbors - Spring Grove 4879 Spring Grove Avenue Cincinnati OH 45232 513-681-5738 **Capabilities:** Hazardous and non-hazardous waste disposal.	**Clean Harbors PPM LLC** 1672 E. Highland Road Twinsburg, OH 44087 330-425-3825 **Capabilities:** Hazardous and non-hazardous waste disposal.	**CWM Chemical Services** 1150 Balmer Road Model City NY 14107 716-754-8231 **Capabilities:** Hazardous and non-hazardous waste disposal. PCB landfill (soil)
Clean Water of New York 3249 Richmond Terrace P.O. Box 030312 Staten Island, NY 10303 718-981-4600 **Capabilities:** Non-hazardous waste disposal.	**Deep Green** 1106 River Road New Windsor, NY 12553 845-562-9566 **Capabilities:** Non-hazardous petroleum contaminated soil	**E-Solutions USA** 200 Engineers Road Hauppauge, NY 11788 631-234-7362 **Capabilities:** Electronic Waste
East Coast Railroad Services 42 Argenio Drive New Windsor, NY 12553 845-565-7210 **Capabilities:** Recycling of wood and concrete railroad ties	**East Penn Manufacturing Co., Inc.** Deka Road Lyon Station, PA 19536 610-682-6361 **Capabilities:** Recycling of lead acid batteries	**EQ Detroit** 1923 Fredrick Street Detroit, MI 48211 800-592-5489 **Capabilities:** hazardous and non-hazardous waste treatment/disposal

EQ Michigan 49350 I-94 Service Drive Bellville, MI 48111 800-592-5489 **Capabilities:** Hazardous and non-hazardous waste disposal, PCB landfill	**EQ Pennsylvania** 730 Vogelsong Road York, PA 17404 800-592-5489 **Capabilities:** Hazardous and non-hazardous waste disposal	**EQ Transfer & Processing** 2000 Ferry Street Detroit, MI 48211 800-592-5489 **Capabilities:** Hazardous and non-hazardous waste disposal
High Acres Landfill 425 Perinton Parkway Fairport, NY 14450 800-333-6590 **Capabilities:**	**INMETCO** 245 Portersville Road Ellwood City, PA 16117 412-758-551 **Capabilities:** Recycling of nickel-cadmium and nickel metal hydride batteries	**Minerva Enterprises Landfill** 8955 Minerva Road S.E. Waynesburg, OH 44688 330-866-3435 **Capabilities:** C&D, Asbestos Debris & PCB bulk product material
Modern Disposal Services, Inc. 4746 Model City Road Model City, NY 14107 716-754-8226 **Capabilities:** Non-hazardous landfill	**Salem County Landfill** 52 McKillop Road Alloway NJ 08001 **Capabilities:** non-hazardous landfill	**Stericycle - Providence** 275 Allens Avenue Providence, RI 02905 401-781-6340 **Capabilities:** Hazardous and non-hazardous waste disposal, medical waste management
Stericycle - Hatfield 2869 Sandstone Drive Hatfield, PA 19440 215-822-8995 **Capabilities:** Hazardous and non-hazardous waste disposal, medical waste management	**Tradebe Northeast LLC** 136 Gracey Avenue Meriden, CT 06451 203-238-6754 **Capabilities:** Oil/water and wastewater treatment (hazardous and non-hazardous)	**Tradebe Norlite Corporation** 628 South Saratoga Street Cohoes, NY 12047 518-235-0401 **Capabilities:** Oil/water and wastewater treatment
Tradebe Treatment & Recycling 50 Cross Street Bridgeport, CT 06610 203-334-1666 **Capabilities:** Oil/water and wastewater treatment	**TCI of Alabama** 101 Parkway East Pell City, AL 31525 518-828-9979 **Capabilities:** PCB transformer and oil management	**TCI of NY, LLC** 39 Falls Industrial Park Road Hudson, NY 12534 518-828-9979 **Capabilities:** Transformer disposal

Interstate Batteries **10 John Walsh Boulevard** Peekskill, NY 10566 914-737-6681 **Capabilities:** Recycle Lead Acid Batteries	

Transporters and Service Providers

Miller Environmental Group 169 Stone Castle Road Rock Tavern, NY 12575 1-800-394-8606 *Multiple Locations* **Capabilities:** Hazardous and non-hazardous rolloff, vacuum truck and drum transportation as well as site services and load assistance	**Moran Environmental Group** 20 Commerce Road Newtown, CT 06740 203-270-0095 **Capabilities:** Hazardous and non-hazardous rolloff, vacuum truck and drum transportation as well as site services and load assistance	
Citiwaste LLC 100-02 Farragut Road Brooklyn, NY 11236 718-372-3887 **Medical waste management and transportation**	**Freehold Cartage, Inc.** 825 Highway 33 Freehold, NJ 07728 732-462-1001	**HAZMAT Environmental Group** 60 Commerce Drive Buffalo, NY 14218 716-827-7217
J&D Trucking 3526 NW Blvd. Vineland, NJ 08360 856-362-3959	**Page, E.T.C., Inc.** 2758 Trombley Road Weedsport, NY 13166 800-233-2126	**PARS Environmental, Inc.** 500 Horizon Drive, Suite 540 Robbinsville, NJ 08691 800-959-1119

East Coast Railroad Services 42 Argenio Drive New Windsor, NY 12553 845-565-7210	**Tradebe Transportation** 136 Gracey Avenue Meriden, CT 06451 203-238-6754	
Cuenca Coronel Trucking, Inc. 74 Academy Street Belleville, NJ 07109 973-842-8937 *MBE and DBE paperwork on file*	**Trimvirate Environmental Inc.** 200 Inner Belt Road , Somerville, MA 02143 617-628-8098	**Asbestos Transportation, Inc.** 2 Moriches Middle Island Road Shirley, NY 11967 631-924-5050

Laboratories

York Analytical Labs 120 Research Drive Stratford, CT 06615 203-325-1371	**American Analytical Laboratories** 56 Toldeo Street Farmingdale, NY 11735 631-454-6100	**EET Essential Environmental Technologies** 208 Route 109, Suite 101 Farmingdale, NY 11735 631-249-1456

Instructions: Complete pages 1 and 2 and submit with each waste management plan submittal (i.e. initial plan, plan revisions, annual reports, final report)

Metro-North Railroad

Capital Programs
Waste Management Plan Submittal

Initially Prepared	Updated/Revised	Final Waste Management Report
Click here to enter a date.	Click here to enter a date.	Click here to enter a date.
Contract Number	Start Date	End Date
	Click here to enter a date.	Click here to enter a date.
Project		Metro-North Project Manager
Contractor (Name, Address, Telephone)	Superintendent	Waste Manager
Select which best describes project below		
☐ New Construction		☐ Renovation / Rehabilitation

PURPOSE

Metro-North Railroad is committed to reducing wastes resulting from our projects. To this end, the purpose of this Waste Management Plan is to:

1. Estimate the types and quantities of wastes that will be generated during this project
2. Identify the types of wastes and quantities that can be recycled or diverted from landfills
3. Identify waste handling procedures (containerization, separation)
4. Identify transporters
5. Identify the final destination of wastes (landfills, recycling facilities, TSDF's)
6. Estimate waste management costs

The following plan was prepared by Insert Company Name here and will be adhered to by Insert Company Name here and all of our subcontractors throughout this construction project. Insert Company Name here will be responsible for implementation of this plan, and document adherence to the same throughout the project. It is the responsibility of the Insert Company Name here Site Superintendent, Waste Manager, and the Subcontractors supervisory personnel to ensure on-site execution of this plan. Insert Company Name here will contractually require all Subcontractors to comply with this plan. A copy of this Plan shall be included in all Subcontractor Agreements and require their participation in the waste reduction strategy. Subcontractors will be provided a site orientation to familiarize them with the on-site waste handling process.

RECYCLING/LANDFILL DIVERSION GOALS

This project will recycle, or divert from landfills, a minimum of Click here to enter Percentage to be diverted from landfills percent by weight of non-hazardous construction wastes.

Instructions: Complete pages 1 and 2 and submit with each waste management plan submittal (i.e. initial plan, plan revisions, annual reports, final report)

Metro-North Railroad

Capital Programs
Waste Management Plan Submittal

SUMMARY *(from Waste Management Calculator)*

	Quantity	Units	
Total Waste		Tons	Total waste generated during project
Total Diverted Waste		Tons	Materials diverted from landfills through salvage, reuse, or recycling
Diversion Rate		**%**	Percentage of waste diverted from landfills

Submitted By:	Signature:	Title:	Date:

ACKNOWLEDGEMENT

I have reviewed the Waste Management Plan for this project and understand the requirements of this plan.

General Contractor	Waste Manager	Signature	Date

Subcontractor Company Name	Team Leader / Foreman Name	Signature	Date

WASTE MANAGEMENT PLAN GUIDANCE

The following outline is provided to assist you in preparing the project's Waste Management Plan.

A. WASTE HANDLING STRATEGY OVERVIEW

Describe the following:

1. An overview of the project's waste management strategy
2. What actions will be undertaken to reduce landfilling of wastes through diversion of materials from landfills via reuse, salvage, recycling
3. Describe the types and quantities of waste involved in this project (specific wastes and quantities can be provided on the *Waste Management Calculator* Excel spreadsheet)
4. Identify the materials that can be reused, salvaged, or recycled
5. The percentage of wastes being diverted from landfilling/disposal
6. Identify recyclable materials, and describe how they will be handled on site, how they will be removed from the site, who will be transporting them, and their ultimate destination
7. Identify salvageable / reusable materials, and describe how they will be handled, any steps needed to clean or refurbish them for reuse, how they will be reused, and if removed from site, how they will be removed, who will be transporting them, and their ultimate destination
8. Procedures for the handling of all types of waste including detailed instructions for equipment needed when managing waste, as well as any safety procedures for workers.
9. Special instructions/procedures for managing a particular waste stream (i.e. demolition contractor – recycling of scrap steel, excavation contractor – excavation of contaminated soils, asbestos abatement contractor – asbestos wastes, painting contractor – lead wastes)
10. Procedures for handling regulated, toxic, or other hazardous wastes (i.e. asbestos, lead, mercury, PCB)
11. How wastes will be removed / transported from the site (transporters for specific materials can be identified on the *Waste Management Calculator* Excel spreadsheet)
12. Responsibilities for the coordination and scheduling of waste removal, and delivery of waste containers. Are any special arrangements needed (i.e. MNR conductor flagman, Yardmaster)?
13. How the waste prevention and recycling strategies will be reinforced throughout the project
14. Monitoring of proper waste segregation and containerization
15. Procedures for on-site collection and handling
16. Procedures for containerization/packaging of wastes
17. Procedures for on-site storage

18. Procedures for maintaining security of on-site storage
19. The locations and descriptions (size and type) of waste containers (include waste storage locations on site map in attachments)
20. Procedures for labeling of wastes
21. Procedures for collection, handling, containerization, and storage of liquid wastes and waste water
22. Procedures for collection, handling, containerization, and storage of Universal Wastes (i.e. fluorescent lamps, batteries, mercury containing equipment, electronics)
23. Reference the Spill Prevention & Response Plan
24. Reference the Annual (for multi-year projects) and Final Waste Management Reports and responsibility for maintaining the Waste Management Report
25. Provide affirmation about how your company will ensure the lawful transportation and disposal of wastes under your control
26. Provide statement that the project waste management procedures described complies with all laws governing the handling, containerization, and temporary site storage and transportation and disposal of wastes to be generated.

B. WASTE PREVENTION / REDUCTION STRATEGIES

Describe the following:

1. Waste minimization methods
2. Deconstruction (i.e. reuse)
3. Selective salvage during demolition
4. Reuse of materials on or off site
5. Methods to be implemented to promote separation of reusable and recyclable materials from wastes (i.e. on site sorting, separate waste containers)
6. Means to prevent comingling of wastes (i.e. labeling / signage of containers)
7. Periodic inspections of containers to ensure wastes are going into proper containers

C. POLLUTION PREVENTION MEASURES

Describe the following:

1. On site controls to be implemented to prevent pollution from waste handling

2. Storm water pollution prevention / methods to prevent contaminated runoff / (i.e. secondary containment, covering of waste containers, covering of bulk materials, berm construction, silt fence)

3. Protection of surfaces from wastes (i.e. ground covers, tarpaulins, cutting oils, sawdust, metal cuttings)

4. Timely clean-up of wastes

5. Recovery of spills of waste materials

6. Housekeeping at regular intervals (i.e. responsibilities, frequency)

D. COMMUNICATION & EDUCATION

Describe the following:

1. Education of Subcontractors on the requirements of the Waste Management Plan

2. Coordination with Subcontractors to ensure the requirements of the Waste Management Plan are implemented

3. Orientation of the project management team and work force on the requirements of the Waste Management Plan (i.e. pre-construction conference, project orientation, coordination meetings)

4. Instruction of the workforce on the labeling / identification of waste containers along with a listing of acceptable/unacceptable materials, not to comingle wastes

5. Continued communication throughout the project to reinforce the waste minimization goals and strategies

E. WASTE MANAGEMENT REPORTING

Provide the schedule for submission of the Annual and Final Waste Management Reports.

F. IDENTIFICATION AND QUANTIFYING OF WASTE STREAMS

Utilize the attached Excel spreadsheet to define each waste type, quantity, on-site handling/containerization, transportation, and disposal site to be used during this project. This table shall be updated annually, and a final version submitted upon contract completion.

G. SUMMARY OF TRANSPORTERS, SALVAGE, RECYCLERS & DISPOSAL FACILITIES

Provide the **Company Name, Address, Contact Person, and Phone Number** for the transporters, salvage companies, recycling companies, and disposal facilities to be used on this project. Proposed transporters and disposal facilities must be on Metro-North Railroad's latest approved list.

H. ATTACHMENTS

SITE PLAN

Insert site plan identifying waste storage locations. Include size of containers to be used, and designation for each container

TRANSPORTER PERMITS

Attach copies of permits held by transporters. Transporters must be on Metro-North Railroad's latest approved list.

DISPOSAL FACILITY PERMITS

Attach copies of permits held by disposal facilities. Disposal facilities must be on Metro-North Railroad's latest approved list.

MISCELLANEOUS DOCUMENTATION

Attach copies of disposal receipts, recycling receipts, salvaged materials receipts, scale tickets, manifests, bills of lading, etc. These shall be incorporated into the plan as they become available. All shall be provided with the final submission.

Metro-North Railroad

Waste Management Calculator

Contract Number/Project Description:	Fill in info here	Contractor:	Fill in name here	Date Submitted:	Fill in date here
				Reporting Period:	Fill in period here

Material Description	Salvaged	Reused	Quantity Recycled	Waste Disposed	Total	Unit	% Salvaged, Reused, Recycled	On-Site Handling / Containerization Method	Check One: Comingled & Sorted Off Site	Check One: Separated On Site	Hauler / Transporter	Recycling / Disposal Facility
Example: Clean C&D	*200*		*1,000*	*2,000*	*3,200*	*Tons*	*38%*	*10 cubic yard dumpster*	☐	☑	*ABC123 Environmental Hauler*	*123ABC Disposal Facility*
RECYCLABLES												
Metals (Structural Steel, other ferrous metals, and non ferrous metals)					-	Tons	0%		☐	☐		
Clean C&D (Asphalt, concrete, brick, untreated woods, etc.)					-	Tons	0%		☐	☐		
Car/truck Batteries					-	Tons	0%		☐	☐		
Other Batteries					-	Tons	0%		☐	☐		
Mixed Paper (Newspaper, Cardboard, Paper)					-	Tons	0%		☐	☐		
Mixed Containers (Glass, Plastic, Metal Cans)					-	Tons	0%		☑	☐		
Electronics					-	Tons	0%		☐	☐		
Paints, Thinners, Solvents, and Adhesives					-	Tons	0%		☐	☐		
Mercury containing devices (other than bulbs)					-	Tons	0%		☐	☐		
Antifreeze					-	Tons	0%		☐	☐		
Various Oils					-	Tons	0%		☐	☐		
Fluorescent lamps/bulbs					-	Tons	0%		☐	☐		
Non-hazardous Industrial Waste (treated wastewater)					-	Tons	0%		☐	☐		
Wood Chips					-	Tons	0%		☐	☐		
Other Recycling*					-	Tons	0%		☐	☐		
WASTE												
Lead Waste (Hazardous)					-	Tons	0%		☐	☐		
PCB's					-	Tons	0%		☐	☐		
Asbestos					-	Tons	0%		☐	☐		
Municipal/Mixed Solid Waste					-	Tons	0%		☐	☐		
Other Waste (non-recyclable)*					-	Tons	0%		☐	☐		
SOILS												
Hazardous Soil (Not Suitable for backfill/reuse on site)	n/a	n/a	n/a		-	Tons	n/a					
Non-Hazardous Petroleum Contaminated Soil (Not Suitable for backfill/reuse on site)	n/a	n/a	n/a		-	Tons	n/a					
Non-Hazardous PCB Contaminated Soil (Not Suitable for backfill/reuse on site)	n/a	n/a	n/a		-	Tons	n/a					
Non-Hazardous Soil/Fill					-	Tons	0%					
Non-Hazardous C&D Soil/Fill					-	Tons	0%					

SUMMARY

TOTALS	**-**	**-**	**-**	**-**	**-**
TOTAL WASTE (Sum of all waste)	**-**				
TOTAL WASTE DIVERTED FROM LANDFILLS (Sum of Salvage, Reused, and Recycled columns)	**-**				
DIVERSION RATE (Diverted Waste divided by Total Waste)	**0%**				

Revision: #6 2017.12.01

Metro-North Railroad

REQUEST FOR TRANSPORT AND DISPOSAL OF WASTE

Generator / Client:	Metro North Railroad	**Date:**	
		Type of Project:	Lead Abatement
Contractor:		**OSS Project No.:**	
Site / Location:			
Waste Storage Area:	Address: Coordinates: Contact:		
Notes:			

WASTE INFORMATION							
Number of Drums	**Contents of Drum**	**Lab Report ID Number**	**Sample ID Number**	**Analytical Results (mg/l)**	**Characterization**	**Estimated Weight**	**Generation Date**

WASTE STORAGE AREA CONTACTS		
Name	**Company**	**Phone / Email**

DISTRIBUTION		
Name	**Company**	**Phone / Email**
Brandee Velez	Metro-North Rail Road – Office of System Safety	velez@mnr.org
Griselda Tolosa	Metro-North Rail Road – Office of System Safety	tolosa@mnr.org
Claire Sammon	Metro-North Rail Road – Environmental Compliance	csammon@mnr.org
Jeff Magyar	Metro-North Rail Road – Environmental Compliance	magyar@mnr.org
Karen Miele	Metro-North Rail Road – Environmental Compliance	kmiele@mnr.org

REMOVAL CONFIRMATION				
Confirmed By	**Date of Removal**	**Number of Drums**		
		Hazardous	**Non-Hazardous**	**Other**
Print:				
Signature:				

Hazardous waste storage area is ……
……..
Coordinates are: ……

Insert Photo of coordinates/map

Insert Photo drums

SECTION 02 32 19 - EXPLORATORY EXCAVATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes the requirements for the excavation and backfilling of test pits for the purpose of determining the exact location of underground utilities, pipes, conduits, and footings. The Contractor (hereinafter referred to as Contractor) shall furnish all labor, equipment, and materials to perform this work. Hereinafter, these subsurface features are referred to as utilities.

1.2 STANDARDS AND REGULATIONS

A. Comply with OSHA Requirements for temporary support of excavations.

B. Comply with NYS Industrial Code 53 before excavating

1.3 RESTRICTIONS

A. The test pits needed are not specifically located on the plans. Prior to commencement of work, the Contractor shall submit a test pit and excavation plan to determine the number and location of test pits required to Metro-North and the Engineer for approval.

B. All excavation shall be hand. Mechanical equipment will not be allowed.

C. Any exploratory excavations required that are within the working envelope, or adjacent to, the tracks will require additional considerations for track outages, and shall be planned and coordinated with Metro North.

1.4 SUBMITTALS

A. The Contractor shall submit sketches showing the location of subsurface features that were uncovered in the test pit, including the following information:

1. Horizontal location of utility relative to three individual surface features

2. Depth of feature below surface

3. Elevation of feature

4. Survey coordinate of feature

5. Diameter, type and condition of pipe or conduit

6. Orientation of pipe, conduit, or structure relative to other site features

7. Test pit identification number

1.5 JOB CONDITIONS

A. Perform test pits within limits of work or area of disturbance, easements, and right of way as

approved by Metro-North.

1.6 RELATED SECTIONS

1.7 **Section 31 00 00 Earth Moving**

PART 2 - PRODUCT

2.1 MATERIALS

Asphalt pavement utilized for backfilling disturbed pavement surfaces shall meet the requirements of NYSDOT Standard Specification Section 608-2.

2.2 EXECUTION

PART 3 - PREPARATION

3.1 Coordinate with third party personnel, including Code 53.

3.2 Provide maintenance and protection of traffic and pedestrian measures as appropriate and to the satisfaction of the Engineer.

3.3 Dig test pits in advance of construction and as ordered by Engineer. Determine exact locations and obtain the required information.

3.4 Upon the receipt of the test pit data, the Engineer may alter proposed installations to avoid conflicts. No additional payment will be made to the Contractor as a result of any necessary alterations.

3.5 When pavement is present, paint the location information of the existing utilities found at the test pit location. When pavement is not present, the Contractor shall place, protect and restore at needed markers that located the existing utilities.

END OF SECTION

SECTION 02 41 00 – DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The extent of demolition and removal work is the minimum required to implement the Work, as shown on the Contract Drawings or as required.

B. The Contractor shall perform all demolition, cutting, patching, removal, and disposal required for the performance of the work shown or implied in the contract documents.

C. The Work also includes the removal (by means of partial demolition) of existing equipment as shown and as scheduled herein and the restoration of those existing surfaces affected by equipment removal.

D. All cutting, patching and removal shall be performed by mechanics skilled in the specific trades involved and such work shall be executed in the best workmanlike manner.

E. It shall be the Contractor's responsibility to protect all existing and new construction, finishes and equipment that are to remain from water damage, weakening or other disturbance. Any such construction that becomes disturbed in any way shall be restored by the Contractor to the satisfaction of the Engineer.

F. While performing cutting and removal of existing equipment, the Contractor shall not cut or remove more than is necessary to accommodate the new construction or alteration.

G. The integrity of all construction shall be maintained at all times.

H. Finished surfaces shall be protected and where they are damaged, whether or not as a result of the Contractor’s operations, shall be repaired or replaced to match existing construction, to the satisfaction of the Engineer.

1.2 RELATED WORK:

A. Section 02 61 00 Sampling, Testing, Handling, Loading, Removal And Disposal of Soils

B. Section 31 23 19 Dewatering

C. Section 31 00 00 Earth Moving

D. Section 31 23 16.26 Rock Removal

E. Section 31 25 00 Erosion and Sedimentation Controls

1.3 SUBMITTALS

A. Submit to the Engineer for approval a detailed demolition plan indicating methods to be employed, procedures, equipment, removal sequence and location of salvageable items.

B. Submit safety measures including signs, barriers, temporary walkways, and any other required safety measures.

C. Submit a list of potential authorized dumpsites (scrap facilities) and their location(s) to be utilized for disposal of demolished items, for MNR approval. Provide scrap facilities with a COVER LETTER FOR ACKNOWLEDGEMENT OF LEAD PAINT COATED STEEL with a copy of the SCRAP STRUCTURAL STEEL CONTAINING LEAD IN PAINT COATING forms. Receipt of the Vendor Acknowledgement Form from the scrap dealer must be received prior to disposal. See the following pages for samples of these forms.

SAMPLE: Cover letter for acknowledgement of lead paint coated steel.

(DATE)

{NAME AND ADDRESS OF SCRAP METAL DEALER}

Dear Sir/Madam:

I understand that your firm will be accepting scrap metal from a Metro-North Commuter Railroad Company location (insert location and project) consisting of (insert type of scrap metal, e.g. catenary towers). Testing has determined that the materials you will be accepting have lead paint on them.

Metro-North's policy is to have the recipient of such material sign an acknowledgement of receiving notification of the presence of lead paint on the scrap steel they are accepting from Metro-North property.

I have attached a copy of the acknowledgement. Please complete the attachment and provide the original to my attention.

Very truly yours,

(INSERT NAME AND TITLE OF METRO-NORTH REPRESENTATIVE)

CC: A. Kirsch (Metro-North) w/attach

SAMPLE: Vendor Acknowledgement Form

SCRAP STRUCTURAL STEEL CONTAINING LEAD IN PAINT COATING

The Vendor indicated below is hereby made aware that the Scrap Structural Steel being transported off-site from the Metro-North Railroad _____ project has paint coatings that contain LEAD

It is the responsibility of the Vendor to insure that appropriate lead abatement precautions/procedures are followed in accordance with the requirements of all regulatory agencies having jurisdiction related to lead-based materials.

Kindly sign and date this document, where indicated below, to acknowledge that you have read this document and your firm will follow appropriate disposal procedures.

Name: _____

Firm: _____

Date:_____

Submit record of actual locations of capped utilities and subsurface obstructions.

1.4 PROJECT CONDITIONS

A. General: The Contractor shall inspect existing conditions where work of this section is to be performed. The Contractor shall take note of and photographically document all conditions that will affect the execution of the work, including but not limited to dimensions of equipment, condition prior to removal, clearances, access, shoring and protection required.

B. Support and Protection: The Contractor shall provide and maintain all required temporary construction and facilities for the adequate support and protection of portions of the existing adjacent structures that are to remain.

C. Job Conditions: To minimize work interruptions, make provisions to ensure that spare parts for removal equipment and a qualified mechanic are available from a local distributor of the equipment.

D. Explosives: The use of explosives for demolition is prohibited.

1.5 REGULATORY REQUIREMENTS

A. Work shall be performed in accordance with the latest edition and addenda thereto of the following:

B. Applicable provisions of the Occupational Safety and Health Standards of the U.S. Department of Labor.

C. Comply with American National Standards Institute (ANSI) Standard A.10.6 - Safety Requirements for Demolition.

D. In the event of any conflict between these specifications and referenced codes, the most stringent requirements as determined by the Engineer shall be followed.

E. Obtain required permits from all authorities.

F. Conform to procedures applicable when discovering hazardous or contaminated materials.

G. Contractor shall employ all safe work practices and document procedures.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials required for patching shall be new and shall match in every respect, to the satisfaction of the Engineer, adjacent portions of the existing construction.

PART 3 - EXECUTION

3.1 GENERAL

A. Under no circumstances shall any demolition or equipment salvage commence at Scarsdale or Hartsdale Stations until the Contractor receives written approval from Metro-North to commence demolition and salvage operations.

B. Existing equipment shown on the Contract Drawings and herein not specified to be salvaged, shall be disposed of by the Contractor away from the property of Metro-North.

C. Salvaged equipment shall be crated, clearly marked on all sides, removed, transported and unloaded in undamaged condition at the Metro-North facility at 100 Water Street, Ossining, NY.

D. Burning on Metro-North property is not permitted.

E. The Contractor shall inspect the site and protect all existing utilities and construction that are to remain during removal operations.

F. Do not damage or disturb any adjacent pavements, structures or existing work which are to remain in place. Should such damage occur due to the Contractor's operations, repairs shall be immediately made to the satisfaction of the Engineer.

3.2 PREPARATION

A. Prior to beginning demolition or salvage the Contractor shall verify that all utilities have been notified and service has been disconnected or protected in accordance with Industrial Code Rule 53 of the State of New York.

B. The Contractor shall construct necessary safety signs, barricades, fences, ramps and walks to protect Metro-North employees and others.

C. The Contractor shall provide all necessary temporary utilities to perform the work.

3.3 DISPOSAL

A. See Division 1 – General Requirements.

3.4 REPAIRS

3.5 Structures and other appurtenances damaged by the demolition and removal operations shall be repaired as directed by the Engineer. All necessary final clean up of the site shall be performed.

END OF SECTION

SECTION 02 61 00
SAMPLING, TESTING, HANDLING, LOADING, REMOVAL AND DISPOSAL OF SOILS

PART 1 GENERAL

1.01 SUMMARY

Section includes requirements for the sampling, testing, loading, handling, on-site reuse, and off-site transport and disposal of soils. Requirements of this section apply to:

1) Soils to be excavated and re-used within the project limits or relocated from one Metro-North Railroad property / location to another; moved from one location to another that is not within the contiguous confines of the work site subject to the approval of Metro-North Railroad Department of Environmental Compliance and Services, and

2) Soils to be removed from Metro-North Railroad property and disposed of off-site at an appropriately permitted disposal facility subject to the approval of Metro-North Railroad Department of Environmental Compliance and Services.

The Contractor shall provide a qualified Environmental Professional (EP) to support the work required by this section. See Section 1.06(B).

The Contractor shall utilize transportation and disposal facilities from Metro-North Railroad's list of approved facilities. Refer to most recent revision of *"Metro-North Railroad Environmental Compliance & Services Approved Waste Management Consultants, Disposal Facilities, Transporters, and Laboratories".*

The Contractor must comply with all applicable Federal, State, County and Local regulations. The more restrictive law, rules and regulations will govern, including revisions to date of Contract.

It shall be known that terms in the singular may represent terms in the plural (i.e. laboratory /

laboratories, facility / facilities, transporter / transporters).

1.02 RELATED SECTIONS

Section 01 33 60 Safety, Health, and Environmental Control
Section 01 35 43 Environmental Protection
Section 01 74 19 Construction Waste Management
Section 31 32 19 Dewatering
Section 31 20 00 Earth Moving

1.03 ABBREVIATIONS AND ACRONYMS

ASP	Analytical Services Protocol
ASTM	American Society for Testing and Materials
BUD	Beneficial Use Determination
C&D	Construction and Demolition
CFR	Code of Federal Regulations
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
EP	Environmental Professional
FSP	Field Sampling Plan
SCR	Soils Characterization Report
NYCRR	New York Codes, Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCBs	Polychlorinated Biphenyls
PPB	Parts per Billion
PPM	Parts Per Million
QA/QC	Quality Assurance/ Quality Control
SCO	Soil Cleanup Objective
SCL	Soil Cleanup Level
SHP	Soil Handling Plan
SHECP	Safety, Health and Environmental Control Plan
SSCO	Supplemental Soil Cleanup Objectives
TAL	Target Analyte List
TCL	Target Compound List
TPHC	Total Petroleum Hydrocarbon

1.04 STANDARDS AND REGULATIONS

A. Protection of underground facilities shall be conducted in accordance with Metro-North Railroad's *"Protection of Underground Metro-North Railroad Facilities"*, 16 NYCRR Part 753, and Dig Safely New York.

B. The Contractor must comply with all applicable rules and regulations, including but not

limited to, the applicable provisions of the following regulatory agencies:

1. United States Department of Transportation
2. United States Environmental Protection Agency
3. Occupational Safety and Health Administration
4. New York State Department of Environmental Conservation
5. New York State Department of Health
6. New York State Department of Transportation
7. Metropolitan Transportation Authority

1.05 SUBMITTALS

A. **General**

1. The Contractor must prepare and submit for approval three (3) copies of the submittals required by this section. Submittals shall be transmitted to the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer. Submittals shall be in accordance with the requirements of the general terms and conditions and the requirements of this Section.
2. Do not submit subsequent submittals until previous submittals are approved by Metro-North Railroad Department of Environmental Compliance and Services (i.e. approval of the Soil Handling Plan is contingent upon approval of the Field Sampling Report and the Field Sampling Summary and Soils Characterization Report).
3. See Section 1.06 Quality Assurance for submittal content / requirements.

B. **Schedule**

1. The Contractor must include the work required by this section in its anticipated schedule.

C. **Environmental Professional (EP)**

1. The Contractor shall identify and provide the credentials of the firm and/or individual serving in this capacity. See Section 1.06(B)

D. **Field Sampling Plan (FSP)**

1. Prepare a Field Sampling Plan (FSP) that prescribes the sampling and laboratory analyses to characterize soils for suitability for reuse on-site and/or off-site disposal. See Section 1.06(C) and (D)

E. **Analytical Laboratories Certifications & Accreditations**

1. Identify the analytical laboratory to be utilized and provide their accreditations and credentials for the analyses to be performed. See Section 1.06(E)

F. **Soils Characterization Report (SCR)**

1. Submit a Soils Characterization Report (SCR) within twenty-one (21) days of completion of the work outlined in the Field Sampling Plan (FSP) and receipt of

laboratory analytical data. See Section 1.06(F)

G. **Soil Handling Plan (SHP)**

1. Submit a Soil Handling Plan (SHP) upon approval of the Soils Characterization Report (SCR). See Section 1.06(G)

H. **Transporter Information**

1. Identify the proposed transporter to be utilized for each of the soil classifications and provide their transporter permits and licenses for the soil classifications they will be hauling. See Sections 1.06(H), and 3.08.
2. The proposed transporter shall be from Metro-North Railroad's list of approved transporters. Refer to most recent revision of *"Metro-North Railroad Environmental Compliance & Services Approved Waste Management Consultants, Disposal Facilities, Transporters, and Laboratories".*

I. **Disposal Facility Information**

1. Identify the proposed disposal facility to be utilized for each of the soil classifications and provide their permits and licenses for the soil classifications they will be accepting. See Sections 1.06(I), and 3.08.
2. The proposed disposal facility shall be from Metro-North Railroad's list of approved disposal facilities. Refer to most recent revision of *"Metro-North Railroad Environmental Compliance & Services Approved Waste Management Consultants, Disposal Facilities, Transporters, and Laboratories".*

J. **Waste Manifest Records, Shipment Records and Certificates of Disposal**

1. Provide applicable waste manifest records, bills of lading, shipment records, scale tickets, and certificates of disposal for each truck and/or container load of soil taken off-site for disposal. See Sections 1.06(J)

1.06 QUALITY ASSURANCE

A. **Schedule**

1. The Contractor must include the work required by this section in its schedule. The schedule shall include the time required for the preparation and review of the submittals by the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer, and actual performance of the work required by this section (i.e. field sampling, laboratory analysis, soils characterization/classification, soil excavation and placement, loading of soils for transport, backfill/re-use/placement, off site removal and disposal).
2. In order to prevent delays in the schedule, the Contractor must anticipate and allot time for the following in their schedule:
   a. Preparation of the FSP (to be determined by the Contractor)
   b. Review/approval of the FSP by the Metro-North Department of Environmental Compliance and Services and the Engineer
   c. Implementation of the FSP, including collection of samples, and analysis of soil

samples by the laboratory (to be determined by the Contractor)

3. Preparation of the SCR within twenty-one (21) days of completion of the work outlined in the Field Sampling Plan (FSP) and receipt of laboratory analytical data. See Section 1.06(F)
    a. Review/approval of the SCR by the Metro-North Department of Environmental Compliance and Services and the Engineer
    b. Preparation of the SHP (to be determined by the Contractor)
    c. Review/approval of the SHP by the Metro-North Department of Environmental Compliance and Services and the Engineer
    d. Implementation of the SHP, including re-use and/or loading, off-site transport and disposal of soils (to be determined by the Contractor)
    e. Receipt of waste manifest records, shipment records and certificates of disposal (to be determined by the Contractor)

B. **Environmental Professional (EP)**

1. The Contractor shall provide an individual to serve as the Environmental Professional (EP) and support the work required by this section. The Contractor shall submit a qualifications package on the firm and/or individual fulfilling this roll. At a minimum, the EP shall meet the following requirements:
    a. The Environmental Professional possess sufficient specific education, training, and experience necessary to exercise professional judgment to develop opinions and conclusions regarding conditions indicative of releases or threatened releases on, at, in, or to a property, sufficient to meet the objectives and performance of the work required by this section.
    b. The Environmental Professional must:
        i. Hold a current Professional Engineer's or Professional Geologist's license and have the equivalent of three (3) years of full-time relevant experience; or
        ii. Be licensed or certified by the federal government or state to perform environmental assessments and have the equivalent of three (3) years of full-time relevant experience; or
        iii. Have a Baccalaureate or higher degree from an accredited institution of higher education in a discipline of engineering or science and the equivalent of five (5) years of full-time relevant experience; or
        iv. Demonstrate a minimum of ten (10) years of experience in performing similar work (i.e. developing field sampling strategies, soil sampling, interpretation of laboratory data/sample results, characterization of soils for disposal)
    c. Relevant experience, as used in the definition of Environmental Professional in this section, means: participation in the performance of all appropriate inquiries, investigations, environmental site assessments, or other site investigations that may include environmental analyses, investigations, and remediation which involve the understanding of surface and subsurface environmental conditions and the processes used to evaluate these conditions and for which professional

judgment was used to develop opinions regarding conditions indicative of releases or threatened releases to the subject property.

C. **Field Sampling Plan (FSP)**

1. The Contractor must conduct soil testing pursuant to a Field Sampling Plan (FSP) approved by Metro-North Railroad Department of Environmental Compliance and Services. The Contractor must submit a Field Sampling Plan (FSP) meeting all requirements of this Section to the Metro-North Department of Environmental Compliance and Services and the Engineer for approval.
2. The resulting data shall be used to prepare a Soils Characterization Report (SCR) See Section 1.06(F) for purposes of classifying the soil types present at the site; determining whether reuse/backfilling of the soil is allowable; determining appropriate Personal Protective Equipment for those who will come in contact with the soil; and identifying what Metro-North-approved transporters and disposal sites will be used in connection with the proper transport and disposal of soils that cannot be backfilled/re-used on site. The Contractor is also required to prepare a Soil Handling Plan (SHP) based upon the information obtained during the preparation and execution of the FSP and SCR. See Section 1.06(G).
3. The FSP must include, but is not limited to, the following:
    a. The testing program to be conducted for all soils in the areas to be excavated during construction (including all associated utility and support work). Identification of the proposed in-situ and/or stockpile samples per unit volume as required by Part 1.06D Soil Sampling and Testing of this Section. Where applicable, the FSP will divide areas into distinct in-situ or stockpiled segments, identifying the volume of soil or fill that each sample will represent. The FSP shall include methodology to complete sampling of in-situ or stockpiled soil to obtain a continuous vertical profile of the soil in order to allow for compositing of samples for proper classification.
    b. Description of sampling procedures and equipment to be used. Description of the method to be utilized to prevent mixing of soil if obvious changes in condition are encountered. Samples shall be placed in laboratory-clean sample containers provided by the analytical laboratory.
    c. The depths to which sampling will be conducted. The sampling depths shall be commensurate with the depth of soils to be encountered during excavation; as either required by the Contract, or by the anticipated depth of the substructure to be installed.
    d. The visual and olfactory inspection of all samples by the Environmental Professional (EP), when they are being collected in the field, to verify the presence or absence of petroleum and/or other such evidence of potential contamination.
    e. Identification of the sample container labeling and sample handling protocol. Immediately after sample collection, each sample container shall be properly sealed to ensure its integrity through receipt at the laboratory. Each sample container shall be labeled with a unique sample identification number just prior to, or immediately after, sample collection and sealing of the container. The sample

identification number shall directly correlate to the attributes of that sample, including but not limited to, contract number, project description, project location, Contractor's name, sample location, sample depth, date and time of sampling, sample inventory number as it correlates to sampling grid, and parameters to be analyzed. Sample attributes shall be recorded on a sampling data sheet and/or chain-of-custody form.

f. A scaled drawing or map of the site showing existing fixed landmarks and the proposed excavation limits. The drawing/map will contain specific sampling locations or proposed stockpiling sampling that will conform to the sampling frequency requirements set forth in Part 1.06D Soil Sampling and Testing.

g. A description of how the contractor will prevent the comingling/mixing of soil stockpiles after sampling. Stockpiles shall not be comingled/mixed unless allowed by the Environmental Professional and the SCR and approved by the Metro-North Railroad Department of Environmental Compliance and Services.

h. A discussion of the field notes that will be maintained by the Contractor during sampling and excavation to allow correlation of sample analysis results with the respective areas, stockpiles, or soil that the data represent, and to verify quantities of soil classification types to be disposed. The field notes made during the sampling shall at a minimum consist of:

   i. Boring or probe logs from each sampling location sampled in that manner that will contain a continuous stratigraphic description of all soil to be encountered during excavation to the depth required by the contract or as required by the anticipated depth of the substructures. Each boring log will include a continuous description of soil including, but not limited to, color, odor, relative grain size distribution, soil composition (including, but not limited to, ash, slag (i.e., material remaining after smelting operations that is typically comprised of metal oxides and silicon dioxide or metal sulfides and elemental metals), organic-free silt, sand, gravel and clay), moisture content, cohesive properties, and relative density (ASTM 1586-D or equivalent), discoloration, sheen, or indication of obvious contamination.

   ii. The location of each sampling point identified via survey or GIS coordinates plotted on a scaled drawing or map. The sampling point shall be located in such a manner that return to that particular location is possible for future sampling if necessary (i.e. survey coordinates, GIS geo located).

   iii. Depth intervals for each sample

   iv. Sample type (grab sample or composite sample)

   v. Any special notes which are included on the laboratory chain-of-custody forms

i. The chain-of-custody form that will accompany each set of one or more samples being submitted for laboratory testing. The chain-of-custody shall identify the samples and any special instructions to the laboratory. The chain-of-custody form shall be signed, with date and time, at all changes in sample custody.

j. Identification of the analytical laboratory proposed to complete the laboratory analysis consistent with the requirements outlined in Part 1.06E Analytical

Laboratories.

k. Listing of all analyses to be performed, by sample, and a description of QA/QC samples that will be submitted (i.e. field blanks, spiked samples).

l. The proposed transporter(s) and disposal facility(ies) to be utilized for soils that cannot be backfilled/reused shall be from Metro-North Railroad's approved list. Refer to most recent revision of *"Metro-North Railroad Environmental Compliance & Services Approved Waste Management Consultants, Disposal Facilities, Transporters, and Laboratories"* and *Sections 1.06(H) and 1.06(I).*

m. As an alternative, the FSP can identify one of Metro-North's on-call waste management firms as the entity to arrange for transport and disposal of the soil classification types involved in the project. If the approved disposal facility is/are not available when the disposal operations begin, the Contractor will be fully responsible for procuring a new Metro-North-approved disposal facility at no additional cost, and with no claims for delay. Any additional sampling, analysis, delay in approval, and labor involved in submitting new disposal facilities after the initial disposal facilities are accepted will be at the Contractor's expense.

4. Sampling shall not be conducted until the Metro-North Department of Environmental Compliance and Services and the Engineer has reviewed and formally approved the FSP in writing. The Metro-North Department of Environmental Compliance and Services will approve the FSP only if it clearly provides for the information to allow for the classification of all soil proposed for excavation in accordance with the definitions of soil classification stated in Section 1.07. Any changes in protocol must be submitted by the Contractor for the review and approval of the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer prior to sampling.

5. The Contractor will be advised by the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer if there is a need for additional samples to be collected after reviewing the initial sampling data. Additional sampling ordered by the Metro-North Department of Environmental Compliance and Services and the Engineer to replace data that was deemed by the Metro-North Department of Environmental Compliance and Services and/or the Engineer to be unusable or unacceptable will be performed at the Contractor's expense, and the time delays and the work associated with submissions, approvals, sample collection, analysis, and data review of the additional samples, shall be the responsibility of the Contractor.

6. Additional samples outside those listed in the FSP, collected and sampled by the Contractor, for the Contractor's convenience and not ordered or approved by the Metro-North Department of Environmental Compliance and Services and/or the Engineer, shall be at no additional cost to Metro-North.

D. **Soil Sampling and Testing**

1. The Contractor will be responsible for determining the actual required frequency of sample collection and analysis and the testing/analytical parameters that are necessary to satisfy the proposed disposal facilities.

2. The number and type (grab, composite) of soil samples to be collected for Total Concentrations testing will be based on the volume (e.g., cubic yards) of soil to be

excavated and potentially re-used/disposed in relation to the requirements set forth in NYSDEC DER-10 Table 5.4(e)10 and NYSDEC CP-51 Table 4, table provided below for convenience. At a minimum, sampling frequency shall follow the table below. However, the actual frequency of samples to be collected and tested will be determined by the approved disposal facility or facilities.

Recommended Number of Soil Samples for Soil Imported to or Exported from a Site

Contaminant	VOC's [(a)]	SVOC's, Inorganics, PCB's, Pesticides	
Soil Quantity (cubic yards)	Discrete Samples	Composite	Discrete Samples/Composite
0-50	1	1	Each composite sample for analysis is created from 3-5 discrete samples from representative locations in the soil/fill
50-100	2	1	
100-200	3	1	
200-300	4	1	
300-400	4	2	
400-500	5	2	
500-800	6	2	
800-1,000	7	2	
>1,000	Add an additional (2) VOC and (1) composite for each additional 1,000 cubic yards, or consult with NYSDEC.[(b)]		

(a) VOC samples cannot be composited. Discrete samples must be taken to maximize the representativeness of the results

(b) For example, a 3,000 cubic yard soil pile to be sampled and analyzed for VOCs would require 11 discrete representative samples. The same soil pile to be sampled for SVOCs, Inorganics, PCBs and Pesticides would require 4 composite samples with each composite sample consisting of 3-5 discrete samples.

3. The Contractor shall have the soil samples analyzed by a qualified, appropriately accredited, and approved laboratory. Samples shall be analyzed for at least the parameters listed below. The Contractor is responsible for including any other specific analyses required by the disposal facility and State(s) of disposal.
   a. Target Compound List (TCL) volatile organic compounds (Method 8260)
   b. TCL semi-volatile organic compounds (Method 8270)
   c. TCL pesticides (Method 8081)
   d. Chlorinated herbicides (Method 8151)
   e. Target Analyte List (TAL) metals (Method 6010/7470)
   f. Cyanide (Method 9010)
   g. Total Petroleum Hydrocarbons (TPH) (Method 8015)
   h. Ignitability (Method 1010 or 40 CFR 173)
   i. Corrosivity (Method 9045)
   j. Reactivity (Chapter 7.3.2). The reactivity results shall be reported as Total

Releasable Cyanide and Total Releasable Sulfide in mg/kg of soil.

k. Polychlorinated Biphenyls (Method 8082)

l. Full Toxicity Characteristic Leaching Procedure (TCLP) list volatile organic compounds, semi-volatile organic compounds, pesticides, herbicides and metals (Methods 1311, 8260, 8270, 8081, 8151, and 6010/7470).

m. Moisture

E. **Analytical Laboratories**

1. Identify the name and location of the analytical laboratory that will perform analyses/testing of samples for the purpose of soil classification meeting the requirements below. The laboratory shall be identified prior to or during preparation of the FSP.

2. York Analytical Laboratories of Stratford, Connecticut is an example of a facility that meets the project requirements.

3. Analytical laboratories shall retain current accreditation under the New York State Department of Health Environmental Laboratory Approval Program (ELAP) for each of the analytical methods and parameters for the soil analyses required. Additionally, the laboratory must retain the accreditations required by and acceptable to any state where material is proposed to be disposed. Submit copies of current accreditations under the New York State Department of Health Environmental Laboratory Approval Program (ELAP) and any others required by the disposal facilities for each of the analytical methods and parameters for the soil analyses required.

4. The laboratory must perform the analyses in accordance with methods presented in NYSDEC ASP, and if required by the Metro-North Railroad Department of Environmental Compliance and Services and/or the disposal site, report results as ASP Category B deliverables. In addition, other analyses not included in NYSDEC ASP, but required by the disposal facility and/or the host State, must conform to the requirements of that facility and/or the host State. The laboratory's current ELAP certifications shall be for the specific analytical methods required.

5. Sample holding times must comply with NYSDEC ASP holding time requirements. Various state agencies may have specific requirements relative to approved methods, sample holding times, and preservation techniques; the most stringent of these shall be used. All excess samples and extract shall be archived by the laboratory for six (6) months after collection. Disposal of excess soils and extracts shall be the responsibility of the laboratory.

6. The laboratory shall simultaneously submit electronic copies of each data package to the Contractor, the Metro-North Railroad Department of Environmental Compliance and Services, and the Engineer. At a minimum, each analytical data package

prepared by the laboratory shall include the following:

a. Laboratory name and address
b. Date of report
c. Analytical results
d. Non-conformance summary
e. Laboratory batch spikes and duplicates, or other QA/QC checks
f. Chain-of-custody forms
g. Laboratory certification statement
h. Laboratory credentials

F. **Soils Characterization Report (SCR)**

1. The Soils Characterization Report (SCR) shall summarize the field sampling conducted pursuant to the Field Sampling Plan (FSP), the laboratory analytical data, and characterize the soils for reuse and/or disposal. The Soils Characterization Report (SCR) shall include:

   a. All field notes, data from field instrumentation, visual observations and other project related information gathered during the sampling
   b. Legible copies of all boring logs
   c. All laboratory analytical data and corresponding chain-of-custody forms
   d. The location of each sampling point identified via survey or GIS coordinates plotted on a scaled drawing or map
   e. Summary tables comparing the analytical laboratory test results to NYSDEC Part 375 soil cleanup objectives (SCOs), NYSDEC CP-51 soil cleanup levels (SCLs), and NYSDEC Part 371 hazardous waste criteria, as applicable.
   f. Guidance on safety procedures (i.e. recommended safe work practices for persons coming into contact with the soils, personal protective equipment)
   g. Classification of soils at each location sampled, based on the definitions identified in Section 1.07 and as provided by the chosen disposal facilities
   h. Recommendations for re-use and/or disposal of soil generated during construction activities
   i. Summary comparison, in both tabular and graphical (site plan) format, of analytical results and classification criteria
   j. The locations, in detail, of classified soil types, their depths, limits, and their in-situ or stockpiled quantities.
   k. Classification from the Environmental Professional (EP) for specific grids, piles, or areas.
   l. The proposed transporter and disposal facility to be utilized for soils that cannot be backfilled/reused. The proposed transporters and disposal facilities shall be from Metro-North Railroad's approved list. See Sections 1.06(H) and 1.06(I) and

Appendix A: *"Metro-North Railroad Environmental Compliance & Services Approved Waste Management Consultants, Disposal Facilities, Transporters, and Laboratories".*

G. **Soil Handling Plan (SHP)**

1. The Soil Handling Plan (SHP) shall describe the procedures to be used to excavate, load, store/stockpile, maintain soils of differing characterizations separately, transport (on site and off site), quantify, and dispose of soils. The SHP shall describe the handling procedures for soils, including:
   a. the locations, depths, and in-situ or stockpiled quantities of each of the soil classification types to be encountered/disturbed,
   b. the areas and depths of excavation, and the soil classifications to be encountered,
   c. a description of the excavation operation itself, the sequence of excavation, the type of equipment to be utilized, the manpower to support the operation,
   d. transportation methods, both on-site and off-site,
   e. the management of each soil classification type, how soils of differing characterizations will be maintained separately, means of preventing comingling/mixing of soils of differing characterizations
   f. the procedure for stockpiling, appropriate stockpiling locations, and all associated details including siltation and erosion control
   g. which soils will be backfilled/re-used on-site and where they are proposed for backfill/re-use
   h. the disposal of soils that cannot be backfilled/re-used on-site, including estimated quantities, how they will be measured for payment (i.e. disposal facility scale tickets), and the proper documentation of soils for disposal at an approved facility.
2. No soils shall be removed from the site unless prior approval is obtained from the Metro-North Railroad Department of Environmental Compliance.
3. Should soil need to be removed from the site (e.g. soil contaminated beyond reuse limits, or excess soil that cannot be reused on site), the Contractor shall make appropriate provisions to account the for the amount of material to be removed (i.e. how many tons/cubic yards), the frequency of removal (i.e. how many transport vehicles per shift), the availability/ability of transporters to haul, the disposal facility's ability to accept, and the anticipated quantities at the anticipated frequencies. The inability of transporters to haul or the disposal facility's ability to accept soil from the site shall not be grounds for delay.
4. The SHP shall describe the procedure to be implemented when, during excavation, it becomes evident that the soil being excavated is contaminated (e.g., olfactory or visual indication) and differs from surrounding soils, and how this material will be stockpiled and maintained separate from other soils not exhibiting similar characteristics.
5. If soil is to be excavated, stockpiled and then sampled for classification, then the SHP shall be submitted by the Contractor concurrently with its FSP. The approach of

submitting the SHP at the same time as the FSP must be approved by the Metro-North Railroad Department of Environmental Compliance and Services prior to implementing the work. Once field sampling has begun, stockpiles shall not be added to or borrowed from, or commingled with other stockpiles, until the soils are classified and a determination is made regarding their suitability for reuse. Upon completion of field sampling and receipt of laboratory analytical data, the Contractor's Environmental Professional shall prepare the SCR for use in determining soil/fill re-use and disposal options and provide it to the Metro-North Railroad Department of Environmental Compliance and Services.

6. The Contractor shall additionally address the following considerations:

7. Personnel Safety. In accordance with Section 01 33 60, the Contractor will be responsible for the development and implementation of a Safety, Health and Environmental Control Plan (SHECP) that includes provisions for the protection of on-site workers and the public. It is anticipated that Level D personal protective equipment will be required, but the Contractor will be responsible for determining the level of personal protection required and complying with the OSHA standards and the approved SHECP. If hazardous soils, or soils exhibiting characteristics and/or constituent concentrations that the contractor believes warrant off-site disposal, are encountered during construction-related work, the Contractor is to consult with the Metro-North Department of Environmental Compliance and Services with respect to approval of additional precautions to be developed and added to the SHECP.

   a. Environmental effects

   b. Prevention of transporter leaks on-site

   c. Vehicle decontamination verification prior to leaving the site

   d. Initial removal and stockpiling sequence

   e. Dust control, and monitoring if deemed necessary. In accordance with Section 01 35 43, the Contractor will be responsible for the development and implementation of a community air monitoring plan (CAMP) for the protection of the public health, and a SHECP for the protection of site workers, during ground intrusive activities. At a minimum this CAMP must comply with the provisions outlined in NYSDEC DER-10, Appendix 1A, 'Generic Community Air Monitoring Plan' and Appendix 1B 'Fugitive Dust and Particulate'.

H. **Transporter Information**

1. The Contractor shall utilize a transporter for soils that cannot be backfilled/reused from Metro-North Railroad's approved list. Refer to most recent revision of *"Metro-North Railroad Environmental Compliance & Services Approved Waste Management Consultants, Disposal Facilities, Transporters, and Laboratories".*

2. The Contractor must provide to Metro-North Railroad Department of Environmental Compliance and Services and the Engineer copies of all waste transporter licenses and permits including, but not limited to, NYSDEC 6 NYCRR Part 364 Waste Transporter Permits, hazardous waste transporter permits issued under 6 NYCRR Part 372.3, and any other state and local vehicle and waste hauling permits in the submittal. The Contractor may submit multiple Metro-North approved transporters for each soil classification type to anticipate changes in transporters, and/or final

quantities for disposal.

3. The Transporter must comply with all pertinent Federal, State and Local regulations regarding the transport of soils.

I. **Disposal Facility Information**

1. The Contractor shall utilize a disposal facility from Metro-North Railroad's list of approved disposal facilities for soils that cannot be backfilled/reused. Refer to most recent revision of *"Metro-North Railroad Environmental Compliance & Services Approved Waste Management Consultants, Disposal Facilities, Transporters, and Laboratories".*

2. The Contractor must provide to the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer the following information for each disposal facility:

   a. Copies of the current appropriate operating permits indicating a physical description of both the type of soils allowed and not allowed for final disposal.

   b. The maximum allowable concentrations of contaminants that can be accepted as indicated in NYSDEC 6 NYCRR Sub part 375. The facility will review data reports pertinent to the soil proposed for disposal and confirm that the soil complies with its existing permits.

   c. Analytical protocol requirements for sampling prior to accepting soil for disposal, including specific parameters, protocols, and minimum detection limits.

   d. The site-specific minimum sampling frequency, in samples per cubic yard of in-situ or stockpiled soil, and the facility's standard practices for determining classification of soil.

   e. Daily, annual, and project specific volume of each classification of soil that it is permitted to accept and a written indication as to the total and daily volume of soil that will be accepted from this project.

   f. Any state environmental agency sampling, analytical, or review requirements for soil being transported to a proposed disposal location outside of New York State.

   g. A list of any violations, citations, and administrative complaints from federal, state, and local agencies

J. **Waste Manifest Records, Shipment Records and Certificates of Disposal**

1. Provide waste manifests, bills of lading, shipment records and certificates of disposal for each truckload of soil removed from the site. Manifests and other documentation shall be properly prepared, filed, and distributed by the Contractor in accordance with regulatory requirements. Upon completion of disposal, the completed manifest, bill of lading, scale ticket from the disposal facility, and certificate of disposal shall be mailed or hand delivered directly to the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer.

2. At least two (2) weeks prior to proposed off-site disposal, submit the following to the Metro-North Railroad Department of Environmental Compliance and Services and the

Engineer for approval.

a. Statutory Manifest Documents: A copy of the statutory manifest form and other documents that will be used in connection with the disposal of hazardous soils. Manifests and other documentation shall be properly prepared, filed, and distributed by the Contractor in accordance with regulatory requirements. The Contractor shall type in the name of the generator, transporter and disposal facility on each form. All other pertinent information shall be included on the manifest.

b. Bill of Lading/Record of Waste Transport and Disposal: A copy of the bill of lading / record of waste transport and disposal to be used to track the transportation and disposal of non-hazardous soils. See Appendix B Record of Waste Transport and Disposal. The Contractor may utilize the form provided in Appendix B, or submit their own form to the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer for approval. The bill of lading shall record the following for each truckload: the date, the transporter, the printed name and signature of the transporter's driver, the weight and volume of material on each truckload, the destination / receiving disposal facility, and an acknowledgement by the disposal facility that they have accepted the soil.

3. Scale tickets generated by the disposal facility scale operator identifying the transporter, the transport vehicle/container unique identification number, and its laden and un-laden weights shall be submitted by the Contractor to the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer.

4. Certificates of Disposal: A Certificate or Documentation of Disposal along with each completed manifest shall be prepared by the disposal facility and mailed to the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer once the soil has been properly treated and/or disposal is completed.

1.07 SOIL CLASSIFICATION

For the purposes of this Contract, the following soil classification shall apply. See Table 1.0 *Soil Classification Summary*

A. **Hazardous Soil**

1. Is soil as defined in 40 CFR Part 261 and New York State ECL Section 27-09 or 6 NYCRR Part 371, Identification and Listings of Hazardous Waste including soil containing concentrations that are Hazardous. This would also include soils contaminated with PCBs at or above 50 parts per million (ppm).

2. Hazardous soils must be disposed of at a disposal site that is permitted to accept hazardous waste. This soil is NOT suitable for backfill/re-use on site.

B. **Non-Hazardous Petroleum-Contaminated Soil**

1. Is soil that exhibits a distinct petroleum odor or contains visible petroleum product, or can be associated with a reportable spill, or contains petroleum constituents above NYSDEC Part 375 Soil Cleanup Objectives (SCOs) for protection of groundwater, as well as NYSDEC CP-51 Soil Cleanup Levels (SCLs).

2. Soils associated with a spill are to be handled separately in accordance with NYSDEC Technical Guidance Documents and Policies and direction provided by the Metro-

North Railroad Department of Environmental Compliance and Services.

3. This soil is only suitable for recycling at a licensed, properly permitted, petroleum recycling facility and/or for disposal at an approved and properly permitted disposal facility that can accept non-hazardous petroleum-contaminated soil. This soil is NOT suitable for backfill/re-use on site.

C. **Non-Hazardous PCB-Contaminated Soil**

1. Is soil that contains less than the hazardous waste limit of 50 parts per million (ppm) of polychlorinated biphenyls (PCBs, on a dry weight basis) as referenced in 6 NYCRR Part 371.4(e).
2. Soil that contains greater than 1.0 ppm and less than 50.0 ppm PCBs must be disposed at an approved and properly permitted disposal facility that can accept non-hazardous PCB-contaminated soil.
3. Soil that contains less than or equal to 1.0 ppm PCBs is suitable for backfill/re-use on the Site as it meets the NYSDEC Part 375 soil cleanup objective of 1.0 ppm for PCBs, with any excess disposed at an approved and properly permitted disposal facility that can accept non-hazardous PCB-contaminated soil. Soil with a PCB level greater than 1.0 ppm is NOT suitable for backfill/re-use on site.

D. **Non-Hazardous Soil/Fill**

1. Is soil/fill that is non-hazardous, non-petroleum-contaminated, non-PCB-contaminated (i.e., containing PCB concentrations at or below 1 ppm) soil/fill generated by manufacturing or industrial processes as defined in NYSDEC NYCRR Part 360, Solid Waste Regulations Solid Waste Management Facilities, 360-1.2 (b) (88).
2. Is soil/fill that contains >1% fouled and historic railroad ballast (i.e., containing the constituents and concentrations typically encountered on MNR railroad lines), ash, foundry sand or slag (i.e., material remaining after smelting operations that is typically comprised of metal oxides and silicon dioxide or metal sulfides and elemental metals), end or by-products of incineration or other forms of combustion, coal, coal dust, cinders, etc.
3. This soil/fill is suitable for backfill/re-use on-site, if approved by the Metro-North Railroad Department of Environmental Compliance and Services, and appropriate precautions are followed to preclude off-site migration or impact to the public during construction and post-construction activities. Any excess soil/fill must be disposed at an approved and properly permitted disposal facility that can accept non-hazardous soil/fill.

E. **Non-Hazardous C&D Soil/Fill**

1. Is soil/fill that is non-hazardous, non-petroleum-contaminated non-PCB-contaminated (i.e., containing PCB concentrations at or below 1 ppm), soil/fill, as defined in NYSDEC Division of Solid and Hazardous Materials, 6 NYCRR Part 360, Solid Waste Management Facilities, 360-1.2 (b)(38).
2. Is soil/fill that contains <1% fouled and historic railroad ballast, ash, foundry sand or slag, end or by-products of incineration or other forms of combustion, coal, coal dust,

cinders

3. This soil/fill is suitable for backfill/re-use on site, if approved by the Metro-North Railroad Department of Environmental Compliance and Services. Any excess soil/fill must be disposed at an approved and properly permitted disposal facility that can accept non-hazardous C&D soil/fill.

NOTE: THE FOLLOWING TABLE/SOIL CLASSIFICATIONS SHALL BE USED TO DEVELOP THE UNIT PRICE SHEET FOR SOIL DISPOSAL

Table 1.0 - Soil Classification Summary

SOIL CLASSIFICATION	DESCRIPTION	SUITABILITY FOR REUSE
Hazardous	• Soils containing concentrations that are Hazardous as defined in 40 CFR Part 261 and New York State ECL Section 27-09 or 6 NYCRR Part 371, Identification and Listings of Hazardous Waste. • Soils containing PCBs at or above 50 parts per million (ppm).	**No** - must be disposed of at a disposal site that is permitted to accept hazardous waste
Non-Hazardous Petroleum Contaminated	• Soils exhibiting a distinct petroleum odor or containing visible petroleum product. • Soils associated with a reportable spill. • Soils containing petroleum constituents exceeding NYSDEC Part 375 soil cleanup objectives (SCOs) for commercial use or protection of groundwater • Soils containing petroleum constituents exceeding NYSDEC CP-51 Soil Cleanup Levels (SCLs).	**No** - suitable for recycling at a licensed properly permitted petroleum recycling facility and/or for disposal at an approved and properly permitted disposal facility that can accept non-hazardous petroleum-contaminated soil
Non-Hazardous PCB Contaminated	• Soils containing greater than 1.0 ppm and less than 50.0 ppm (>1.0 ppm and <50 ppm) PCBs (on a dry weight basis) as referenced in 6 NYCRR Part 371.4(e).	**> 1.0 ppm PCB's – No** - must be disposed of at an approved and properly permitted disposal facility that can accept hazardous PCB-contaminated soil. **< or = 1.0 ppm PCB's – Yes** – but any excess must be disposed of at an approved and properly permitted disposal facility that can accept non-hazardous PCB-contaminated soil.
Non-Hazardous Soil/Fill	• Soil/fill that is non-hazardous, non-petroleum-contaminated, non-PCB-contaminated and is generated by manufacturing or industrial processes as defined in NYSDEC NYCRR Part 360, Solid Waste Regulations Solid Waste Management Facilities, 360-1.2 (b) (88). • Contains >1% fouled and historic railroad ballast, ash, foundry sand or slag, end or by-products of incineration or other forms of combustion, coal, coal dust, cinders, etc.).	**Yes** – upon approval of the Metro-North Dept. of Environmental Compliance and Services. Any excess soil must be disposed of at an approved and properly permitted disposal facility that can accept non-hazardous soil/fill.
Non-Hazardous C&D Soil/Fill	• Soil/fill that is non-hazardous, non-petroleum-contaminated, and non-PCB-contaminated, , as defined in NYSDEC Division of Solid and Hazardous Materials, 6 NYCRR Part 360, Solid Waste Management Facilities, 360-1.2 (b)(38) • Contains ≤1% fouled and historic railroad ballast, ash, foundry sand or slag, end or by-products of incineration or other forms of combustion, coal, coal dust, cinders, etc.).	**Yes** – upon approval of the Metro-North Dept. of Environmental Compliance and Services. Any excess must be disposed of at an approved and properly permitted disposal facility that can accept non-hazardous C&D soil/fill.

1.08 PERMITS

The Contractor must obtain and pay for all required permits, fees and inspections by authorities having jurisdiction for soil removal and disposal.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor shall furnish all labor, equipment, materials, permits, and subcontracted services (e.g. Environmental Professional, field sampling, analytical laboratory, transporter, disposal facility), as necessary, to provide for the lawful reuse of excess soils on site, or removal and disposal of excess soils from the site in accordance with local, state and federal laws and regulations. The Contractor is responsible for all costs associated with the lawful transportation and disposal of soils by one or more of Metro-North Railroad's pre-approved waste transporters and disposal facilities.

B. Prior to conducting subsurface disturbance, borings, or excavation, the Contractor shall follow "*Protection of Underground Metro-North Railroad Facilities*" and 16 NYCRR Part 753.

C. Prepare the submittals required by this Section for approval by the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer. See Sections 1.05 and 1.06 for submittal requirements.

3.02 PREPARATION / INSPECTION

A. Pre-Work Inspection: Prior to the start of work, to verify existing conditions, the Contractor shall inspect and examine the areas where contract work is to be performed and soil disturbance will occur. This pre-assessment shall be used to assist in preparation of the required submittals.

B. Inspections During Work: The Contractor shall provide regular inspections of soil excavation and stockpile areas throughout the duration of the work. The Contractor shall correct conditions without impact to the completion of the Work. The Contractor will not be allowed to proceed until the unsatisfactory conditions have been corrected.

3.03 ENVIRONMENTAL PRECAUTIONS

A. To minimize risk to personnel, the Contractor shall limit access to the excavation areas to as few people as possible. During all excavation, the SHECP, SWP, and SHP shall be followed.

B. During excavation, the Contractor shall maintain grading and drainage of the site so that no stormwater runs from outside the excavation into the excavation. Rainwater falling directly into the excavation shall be allowed to percolate into the soil. Should dewatering be required, it shall be conducted in accordance with specification Section 31_23_19 Dewatering.

C. Transport vehicles must be cleaned prior to departure from the site to reduce the risk of losing soil and/or debris on public roads. Cleaning is to include, but not be limited to: wheels, tires, and under carriages. The Contractor shall construct "knock off" pads at the

exits from the construction / excavation areas as necessary to assist with vehicle cleaning.

D. All soils to be excavated must be sampled in-situ and/or moved directly to the stockpiling area for sampling in accordance with the FSP. All excavated soils are to be tested and classified prior to removal and/or loading into transport vehicles.

E. The Contractor shall identify, in detail, in the Soil handling Plan (SHP), the procedures to avoid commingling of soils from different excavations, or soil that is removed after a classification sample is collected.

3.04 STOCKPILES OF EXCAVATED SOIL

A. On-site stockpiled soil shall not impact the work of any other Contractor. Following the Contractor's sampling, stockpile shall not be added to, moved or otherwise impacted by other soil that could affect the resulting classification of the soil.

B. Refer to specification Section for Environmental Protection. Stockpiles shall be constructed to isolate contaminated soil from the environment. Stockpiles shall be constructed to include:

1. A chemically resistant geo-membrane liner shall be placed on ground surfaces below stockpiles of soils determined unsuitable for reuse. Liners shall be scrim reinforced, having a minimum weight of 40 pounds per 1,000 SF, and a permeability coefficient less than 10-8cm/sec. The ground surface on which the membrane is to be placed shall be free of rocks greater than ½ inch in diameter and any other items that could damage the membrane.

2. A geo-membrane cover to control dust and to prevent precipitation from entering the stockpile. Scrim reinforced membranes shall have a minimum weight of 26 pounds per 1,000 SF. The cover shall be anchored to prevent it from being removed by wind. Stockpiles shall be covered during non-working hours and during periods of no construction activity.

C. The temporary storage of excavated soil in stockpiles shall comply with the dust monitoring and control requirements defined in the NYSDEC DER-10 Appendix 1B, "Fugitive Dust and Particulate Monitoring".

D. A berm shall surround each stockpile, a minimum of 12 inches in height. Vehicle access points shall also be bermed.

E. Provide and maintain siltation control measures (i.e. silt fencing, hay bales, mulch filled socks) around stockpiled soil.

F. No liquids shall be allowed to collect on stockpiles of excavated soil.

3.05 REUSE OF SOIL

A. The Contractor shall take all reasonable efforts to backfill/re-use as much soil on-site as possible. All opportunities must be explored to backfill/re-use excavated soils in compliance with NYSDEC requirements. The Contractor is to consult with the Metro-North Department of Environmental Compliance and Services with respect to backfill/re-

use options. Refer to Table 1.0 – Soil Classification Summary.

B. Soils can be backfilled/re-used at the project site if:

1. they meet the geotechnical requirements of the Project, and,
2. they are classified as Non-Hazardous C&D Soil/Fill, Non-Hazardous Soil/Fill, and Non-Hazardous PCB Contaminated (containing less than or equal to 1.0 ppm PCB's), and
3. the backfill/reuse location is approved by the Metro-North Department of Environmental Compliance and Services.

C. Soil that is not backfilled/re-used on the project site shall be disposed of in accordance with this specification by the Contractor.

3.06 EXCESS SOIL

A. Excess soils that cannot be reused on-site shall be disposed of by the Contractor in accordance with this Section. To assure soil is properly disposed of, no soil shall be removed from Metro-North property without prior written approval from the Metro-North Department of Environmental Compliance and Services.

B. The Contractor must NOT make any arrangements for disposal of soil without following the procedures identified in this specification. No soil is to be assumed 'clean' until it has been determined to be so by the Metro-North Railroad Department of Environmental Compliance and Services.

C. Soil is NOT to be offered for backfill/re-use off-site unless specific written permission is obtained from the Metro-North Railroad Department of Environmental Compliance and Services and if applicable, from the NYSDEC in the form of a Beneficial Use Determination (BUD).

3.07 BORROW SOIL / BORROW PIT TESTING FOR SOURCE APPROVAL

A. No fill soil can be accepted from an off-site source unless approved by the Metro-North Department of Environmental Compliance and Services. In such cases, the Contractor will be required to complete and execute a Clean Borrow Certification and the Metro-North Department of Environmental Compliance and Services reserves the right to require sampling and laboratory analysis to confirm that such fill is clean. Any such costs are to be borne by the Contractor at no expense to Metro-North.

B. For fill and backfill to be accepted from an off-site source, the soil is to be tested using approved methods which yield laboratory limits and meet the following criteria:

1. Contains no compounds or inorganic analytes at concentrations above the lower of 6 NYCRR 375-6.8(b) Unrestricted Use SCOs or Protection of Groundwater SCOs [unless a less restrictive option (e.g., Commercial Use) is approved by the Metro-North Railroad Department of Environmental Compliance and Services];
2. Contains no compounds or inorganic analytes above the lower of the NYSDEC CP-51: Soil Cleanup Guidance for Unrestricted Use and Protection of Groundwater Supplemental Soil Cleanup Objectives (SSCOs);
3. Meets NYSDEC pre-determined beneficial use determination (BUD) requirements

referenced in 6 NYCRR 360-1.15(b);

4. Meets the project geotechnical requirements; and
5. Its use must be approved by the Metro-North Railroad Department of Environmental Compliance and Services prior to being brought on-site.

3.08 TRANSPORTERS AND TREATMENT, STORAGE AND DISPOSAL FACILITIES

A. Soils that require off-site disposal, or cannot be re-used on-site, shall be transported and disposed of in accordance with this Section.

B. The Contractor shall provide transport vehicles that comply with requirements for hauling soil and regulated materials as outlined in NYSDEC regulations (e.g., 6 NYCRR Part 360 and 364). The Contractor is responsible for vehicles having all required permits and approvals.

C. The Contractor shall utilize one or more of the Metro-North Railroad audited and approved waste transporters and disposal facilities, or contract with one of Metro-North Railroad's on-call waste management firms, as necessary, to transport and dispose of soils in compliance with all applicable regulatory requirements. Refer to most recent revision of *"Metro-North Railroad Environmental Compliance & Services Approved Waste Management Consultants, Disposal Facilities, Transporters, and Laboratories"* for waste transporters and disposal facilities that have been audited and approved by Metro-North Railroad.

D. The Contractor may choose to utilize more than one of the Metro-North Railroad approved transporter and disposal facilities. In this case, each facility must be in compliance with the above requirements, and each facility must have the ability to stabilize the soil (when deemed necessary) and dispose of the soil.

E. Should the Contractor choose to submit for use an alternate transporter or disposal facility that is not on the referenced approved list, the Contractor may elect to have an audit of the transporter or disposal facility conducted by Metro-North Railroad's on-call environmental consultant (currently Day Engineering, P.C.), at the Contractor's expense. Submittal of alternates must be initiated in the early stages of the project as to allow sufficient time for the audit to be conducted and completed before the Contractor begins using the alternate transporter or disposal facility. The Contractor shall not utilize the proposed alternate transporter or disposal facility until: 1) the audit is complete, 2) it has been submitted to the Metro-North Railroad Department of Environmental Compliance and Services for review, and 3) they have been approved for use by the Metro-North Railroad Department of Environmental Compliance and Services. The proposed transporters or disposal facilities are required to meet the same audit requirements as the entities already approved by Metro-North Railroad. The request and submittal of an alternate transporter or disposal facility for auditing does not guarantee that the entity will be approved for use by Metro-North Railroad. The Contractor is solely responsible for coordinating the audit with Metro-North Railroad's on-call environmental consultant (currently Day Engineering, P.C.), all costs incurred, and any resulting delays associated with the submittal and auditing process.

F. The Contractor is responsible for contacting transporters and disposal facilities to arrange for transport and disposal of the volumes and classifications of soils specific to the Project.

G. Transporters shall have current Part 364 - Waste Transporter Permits (or permits

applicable for soil characterized). Note that each transporter has specific types of waste that they can transport under their transporter permits and may be limited in their permit as to what disposal sites they may transport to. It is the Contractor's responsibility to make sure that the transporter can transport to the selected disposal site(s).

H. If the approved disposal facility is/are not available when the disposal operations begin, the Contractor will be fully responsible for procuring a new approved disposal facility at no additional cost, and with no claims for delay. Any additional sampling, analysis, delay in approval, and labor involved in submitting new disposal facilities after the initial disposal facilities are accepted will be at the Contractor's expense.

I. The disposal facility must be able to treat and/or dispose of all of the soil removed from the site within the allotted Contract time. The ability of the facility to accept the soil should not limit the rate at which the Contractor can excavate and transport the soil. The Contractor is advised that as transporters and disposal facilities vary in the volume and classification of soils they can transport and dispose, that it cannot be assumed that all facilities can transport and dispose of all amounts and classifications of soils that may be encountered. It is the Contractor's responsibility to confirm that the disposal site(s) can take the classification(s) of soil that will be generated at the necessary volumes.

J. The Contractor may choose to streamline the transportation and disposal process by utilizing the services of one of Metro-North Railroad's on-call waste management firms.

Should it choose to do so, the Contractor will be responsible for contracting directly with the waste management firm and paying that firm directly. Services include performance of the following tasks:

1. Waste identification/classification (including any required lab services).
2. Completion of all necessary waste approval shipping documentation (waste profiles, manifests, bills of lading, land disposal restriction forms, and labels).
3. Arranging for compliant transportation and disposal.
4. Scheduling with the transporters and disposal facilities.
5. When necessary, review of a site to assist in stockpiling and loading logistics.

3.09 Waste Manifest Records, Shipment Records and Certificates of Disposal

A. Provide applicable waste manifest records, bills of lading, shipment records, scale tickets, and certificates of disposal for each truckload of soil removed from the site. Submit this documentation for each soil classification removed from the site for off-site disposal.

B. At least two (2) weeks prior to proposed off-site disposal, submit the following to the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer for approval

1. A copy of the manifest form and other documents that will be used in connection with the disposal of hazardous soils.
2. A copy of the bill of lading form that will be used to track the movement of all identified soil classification types associated with the project.

C. Statutory Manifest Documents: The Contractor must comply with statutory manifest document requirements that are to be used in connection with the disposal of hazardous

soils.

D. The Contractor is responsible for assuring that all transportation vehicles have the required manifests and/or bill of ladings necessary for transporting each truckload of soil for each soil classification type. Each manifest or bill of lading will be signed by the transporter and carried to the approved disposal facility. Prior to the transport vehicle leaving the site, each manifest or bill of lading shall be signed by the Engineer, and a preliminary copy of each partially completed form shall be provided to the Engineer. The Engineer shall provide originals to the Metro-North Railroad Department of Environmental Compliance and Services and retain copies for their records.

E. All trucks shall be weighed upon their arrival to the disposal facility and weigh scale tickets shall be provided. Scale tickets generated by the disposal facility scale shall identify the transporter, the transport vehicle/container unique identification number, and its laden and un-laden weight. Scale tickets must be received back from all disposal sites and provided to the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer.

F. Disposal Facility Records: The Contractor must comply with disposal facility record requirements. The disposal facility shall complete the waste manifest or bill of lading when the disposal facility accepts the waste. The disposal facility is to mail completed waste manifests to the appropriate regulatory agencies. A copy of the completed manifest or bill of lading, along with a copy of the scale ticket from the disposal facility, must be mailed or hand delivered directly to the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer. A Certificate or Documentation of Disposal along with each completed manifest shall be prepared by the disposal facility and mailed to the Metro-North Railroad Department of Environmental Compliance and Services and the Engineer once the soil has been properly treated and/or disposal is completed.

3.010 METHOD OF MEASUREMENT

A. Refer to Measurement and Payment specification.

3.011 BASIS OF PAYMENT

A. Refer to Measurement and Payment specification.

END OF SECTION

PROVIDE THE FOLLOWING ON STANDARD COMPANY LETTERHEAD

(INSERT DATE)

(INSERT COMPANY NAME HERE)

Re: *(INSERT CONTRACT NUMBER & DESCRIPTION)*

CLEAN FILL CERTIFICATION

The undersigned, *(INSERT NAME OF COMPANY OFFICER)*, hereby certifies that the material being brought by *(INSERT COMPANY NAME)*, onto Metro North Railroad property at *(DESCRIBE LOCATION WHERE FILL IS BEING PLACED)* is appropriate for general construction use under the applicable provisions of the Environmental Protection Agency and the New York State Department of Environmental Conservation.

The source of the material is: *(DESCRIBE SOURCE OF SUPPLY)*

The undersigned further certifies that there are no contaminants in the material that pose a threat to persons or to the environment, and that the undersigned has supplied all available test results for the material to Metro-North.

The undersigned agrees that should the appearance and/or odor of the material at any time present a concern to Metro-North, that the material will be removed promptly from Metro-North property or, in the alternative, if agreed to by Metro-North, sampling of the material, as specified by Metro-North, will be undertaken by the undersigned at the undersigned's expense and such sampling results will be provided to Metro-North. The material will remain stockpiled until sampling results have been received and reviewed by Metro-North, and it shall be Metro-North's unilateral determination as to whether delivery of the material may proceed.

CERTIFIED BY: *(INSERT SIGNATURE OF COMPANY OFFICER)*

OF *(INSERT COMPANY NAME)*

DATE: *(INSERT DATE)*

SECTION 02 75 00 – SAWCUTTING PAVEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The Contractor shall sawcut a minimum of 2” through the full depth of the existing pavement with a straight sawcut edge, and do all work as shown on the detail drawings. All work must be done in a workmanlike manner, to the satisfaction of the Engineer in conformance to the requirements specified hereon and shown on the Contract Drawings.

B. The following index of this Specification is included for convenience:

1.2 PAYMENT

A. There shall be no separate payment for the work of this Section, all costs shall be included in the Lump Sum price bid.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SAWCUTTING

A. All work shall be done by competent persons in an approved manner to the satisfaction of the Engineer. Saw cutting shall be done to accurate, neat and straight lines marked previously to commencement of work. Saw cutting shall be done with approved power saws specifically designed and manufactured for such a purpose. Workmen shall wear safety clothing and eye protection while operating saw equipment and shall be thoroughly familiar in the safe operation of the equipment.

B. The Contractor shall perform all necessary chiseling, tack coating of edges, etc., and all other necessary incidental work per the directions of the Engineer. Saw cutting of pavement for test pits in pavements designated to be removed under other contract items and to install sewer and water main pipe and/or their facilities shall be deemed included in lump sum bid.

SECTION 02 75 10 – SAWCUTTING STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes the saw cutting of the existing platform slabs/planks and wearing surfaces at the locations shown in the Contract Documents.

1.2 REFERENCES

A. Comply with the New York State Department of Transportation (NYSDOT) Standard Specifications.

1.3 RELATED SECTIONS

A. Section 02 41 00 – Demolition

PART 2 - PRODUCTS

2.1 MATERIALS

A. None.

PART 3 - EXECUTION

3.1 METHOD

A. The locations where the substrate is to be sawcut shall be marked utilizing instruments and tools which provide straight, visible layout lines. Saw cutting without marked, straight layout lines will not be permitted.

B. The Contractor shall sawcut the existing platform with a straight sawcut edge as shown on the plans or where directed by the Engineer. All work must be done in a workmanlike manner.

C. All saw cuts shall be done in a wet condition.

D. The depth of the sawcut shall be the full-depth of platform or slab established from the contract plans. This shall include saw cutting any reinforcement within the platform sections or slabs to be sawcut. If cutting only existing wearing surface, saw-cut 1” max and chip the remaining depth and retain existing welded wire mesh to lap with existing welded wire mesh.

E. The platform or slab edges to be cut shall be sufficiently supported to protect against pre-mature spalling of the cut edges prior to the completion of the full depth cut.

F. Overcut lines resulting from sawcut intersections such as box-outs shall be cleaned with compressed air and filled with epoxy crack filler.

END OF SECTION

SECTION 02 82 00 – LEAD CONTAINING MATERIALS
TABLE OF CONTENTS

Contents

PART 1 – GENERAL

1.01 Project Overview

The following specification is intended for use with a site specific scope of work for any activity which will disturb lead containing coatings or materials on Metro-North Railroad property. Coating or material disturbance activities may result in occupational exposure to airborne lead particulate as described in 29 CFR 1926.62 Lead Exposure In Construction; Interim Final Rule. The requirements of the following specification shall apply to any and all construction activities known or suspected to result in worker exposure to airborne lead particulate, dust, or fume. Although not specifically covered under this specification, potential for personal or environmental exposure to harmful substances, including heavy metals other than lead, shall be considered when determining the best methods and procedures for executing the work.

All work resulting in the disturbance of lead containing coatings or other lead containing materials shall be conducted utilizing currently accepted lead abatement technologies and standards of practice in compliance with applicable regulations and Metro-North Railroad standards. The Contractor shall conduct all work in a manner which protects the health and safety of contract employees, Metro-North Railroad employees, Metro-North Railroad property, the surrounding community, the public, and the environment.

1.02 Definitions

A. **Action Level** - As set by 29 CFR 1910.1025, the level of exposure that triggers medical surveillance and selected other administrative and/or training controls for workers exposed to lead in general industry is 30 micrograms per cubic meter.

B. **Closed Abrasive Blast Cleaning** - The propulsion of abrasive particles against the surface to be de-leaded by means of compressed air or centrifugal wheels, the blasting action being contained within an enclosure creating a seal to the surface being de-leaded, and having vacuum capabilities for a simultaneous cleaning and blasting action.

C. **Competent Person Responsibilities** - In compliance with OSHA requirements, each Metro-North work site will have a competent person overseeing the work. The competent person will identify lead hazards, determine the strategy of exposure control, and ensure employees performing the work use personal protective equipment and hygiene facilities. The competent person will inspect the work regularly, make note of deficiencies and the corrective steps taken, ensure employees are using equipment properly and oversee maintenance of engineering controls and equipment.

D. **Compliance Program** - As per 29 CFR 1926. 62 (e); the employer's site specific written program which describes engineering controls, work procedures and administrative controls which will serve to limit employees exposure to lead concentrations to, or below the Permissible Exposure Limit. The site specific plan describes hygiene facilities, housekeeping, personal protective equipment, respiratory protection, the scope of work, technology considered to reduce exposures, a description of the activities which will disturb lead and potentially create exposures, identification of the competent person and his/her responsibilities, air monitoring data, etc. all relevant to the site specific scope of work and conditions.

E. **Construction Industry Standards** - As per 29 CFR 1926, "Safety and Health Regulations for Construction", the identification of OSHA standards developed for worker protection in the construction industry.

F. Containment System - The sealing of walls, floors and any entryways. Within the contained area there shall be a ventilation system of either forced or natural air imports and natural or mechanical exhaust. Air filtration systems may exist within the containment system. The purpose and design shall prohibit the emission of lead particulate from within the containment system to the ambient air.

G. Contractor - Any entity that has entered into contract with Metro-North Railroad.

H. Critical Barrier - The installation of flexible, sealed partitions, which prohibit the escape of particulate from the work area.

I. Engineer - The Resident Engineer, Project Engineer, Site Engineer, or Construction Manager, representing the best interest of Metro-North Railroad, and assigned to direct, manage, and oversee the execution of the work.

J. Environmental Monitor - The designated entity or third party, representing the best interest of Metro-North Railroad, responsible for overseeing the Contractor's compliance efforts.

K. Hand Tool Cleaning - Manual scraping, brushing or sanding of loose paint, rust and mill scale. Tools include chisels, knives, hammers, sandpaper and wire brushes.

L. Hazardous Waste (LEAD) - Debris containing 5 parts per million lead or greater when tested as per the Toxic Characteristic Leaching Procedure (TCLP). Lead is assigned the EPA Haz Waste #D008.

M. HEPA - High Efficiency Particulate Air (Filter) - Being, using, or containing a filter designed to remove 99.97% of airborne particles measuring 0.3 microns or greater in diameter passing through it.

N. Histoplasma Capsulatum – Fungus living in the environment, usually in association with large amounts of bird or bat droppings.

O. Histoplasmosis – a disease caused by the fungus Histoplasma Capsulatum.

P. Isolation Barriers - The construction of partitions, the placement of solid materials, and the plasticizing of apertures to seal off the work place from surrounding areas to contain and prohibit emissions.

Q. Lead Health and Safety Plan (LHASP) - Site Specific and meeting the requirements 29 CFR 1026.62 (e) for Site Specific Compliance Plan.

R. Log Book - A permanently bound book kept at the entrance to the work area. This book shall serve as a legal record of each work shifts' activity, profile of crewmembers, signatures of all persons visiting the work site, accidents/incidents and a daily sign-in and sign-out record for the crewmembers. Waste quantities generated, stored and released for transport shall be recorded here on a daily basis. Emergency contact phone numbers shall be listed inside the front cover and a street map containing a highlighted route to the nearest hospital shall be kept with the book.

S. Medical Surveillance Program – For the purposes of this specification, detailed medical examinations and physician consultations for employees who have been exposed to lead above the action level of 30 micrograms per cubic meter of air for more than 30 days per year per 29 CFR 1926.62 (j),.

T. Metro-North Railroad - The Owner, Metro-North Railroad, or a designated entity or third party representing Metro-North Railroad.

U. Movable Objects - Any objects within the work area, which may be cleaned and removed prior to start of deleading.

V. OSHA - Acronym for Occupational Safety and Health Administration

W. Open Abrasive Blast Cleaning - Compressed air is used to propel abrasive particles against the surface being deleaded without the benefit of localized containment.

X. Owner - A person, firm, corporation, guardian, conservator, receiver, trustee, executor or other judicial officer, who, alone or jointly or severally with others, owns, holds, or controls the whole or any part of the freehold or leasehold title to any property, with or without accompanying actual possession of it, and shall include in addition to the holder of legal title, any vendee in possession of it, but may not include a mortgagee or an owner of a reversionary interest under a ground rent lease. In this instance, unless otherwise specified, the owner shall mean Metro-North Commuter Railroad.

Y. Permissible Exposure Limit (PEL) - A limit of exposure to a particular toxic material or harmful physical agent which is published and enforced by OSHA as a legal standard. This standard is typically based upon time weighted average (TWA) concentrations for a normal 8-hour workday over a 40-hour workweek. Per 29 CFR 1926.62, the PEL for workers exposed to lead in construction / general industry is 50 micrograms of lead per cubic meter of air, without regard to the use of respiratory protection.

Z. Polyethylene - Known commonly as plastic sheeting or poly, and having a conformance of 6 mil thickness, unless otherwise specified.

AA. Power Tool Cleaning – De-leading via the use of power operated impact tools. Power tools may include roto peens, disc sanders, needle guns, grinding wheels, brush blasters and similar equipment.

BB. Pressure Washing - Pressurized water, typically up to 4,000 psi, to clean surfaces.

CC. Respirator Fit Test - Qualitative and quantitative testing conducted to assure a respirator fits the employee properly and will function as intended.

DD. Respiratory Protection Program – As defined by 29 CFR 1910.134; the contractor's written program delineating employee training, storage, inspection and selection of respirators.

EE. Solid Panels - Building materials, which are impermeable to dust and may be used for construction of containments or for the purpose of encapsulation.

FF. Tarpaulin - A solid, flexible barrier impervious to dust.

GG. Tent - A flexible, sealed enclosure constructed for limited, localized quantities of de-leading.

HH. Time Weighted Average (TWA) - An employees' average airborne exposure to a particular toxin in over a given period of time, typically an eight-hour work shift of a 40-hour work week.

II. Visible Emission - Any emission of lead particulate or fume, which is detected by the human eye, without the aid of instrumentation.

JJ. Water Jetting - Pressurized water directed against the surface to be de-leaded at 20,000 pounds per square inch pressure (psi), or for ultra-high pressure at 20,000 to 40,000 psi.

KK. Wet Abrasive Blast Cleaning - Compressed air used to propel abrasives against a surface to be de-leaded. Water is injected into the abrasive stream and thereby significantly reduces dust generation.

LL. Worker Decontamination Facility - Appendage to the worksite containing a series of rooms, each segregated from the other by a series of air-locks and curtained doorways. A typical configuration of these rooms runs in a sequential series and includes three chambers; clean area, decontamination area (shower) and equipment room.

1.03 Contract Requirements

A. General

1) The Contractor is solely responsible for the occupational health and safety of the Contractor's employees. The Contractor shall conduct work utilizing all available methods and procedures to protect the health and safety of employees involved in the work, the surrounding community, the public, and to prevent environmental degradation.

2) The Contractor is hereby notified that lead exposure activities include the disturbance of lead containing materials, lead-containing coating removal and subsequent work on surfaces which have been abated of visible coatings. Therefore; these specifications apply to all lead exposure activities which may include but not be limited to coating removal, hot work, such as torch cutting, rivet busting, and use of mechanical or hand tool equipment on surfaces from which coatings have been removed.

3) The Contractor shall provide all labor, materials, equipment, services, certificates, variances, permits, and insurances necessary to execute the site-specific scope of work. The Contractor shall complete the work per the requirements set forth herein and at the direction of Metro-North Railroad, the Engineer, and the Environmental Monitor.

4) Work shall be conducted in compliance with 29 CFR 1926.62 Lead Exposure In Construction; Interim Final Rule, the requirements set forth in these specifications, Metro-North Railroad Operating Rules & Procedures, Society for Protective Coatings (SSPC) Guidelines, all applicable standards and local, state and federal regulations. The Contractor shall conduct the work in accordance with direction provided by Metro-North Railroad or their representative, the Project Engineer, Project Management, the Environmental Monitor, and any agency having jurisdiction over the work.

5) The Contractor shall comply with the requirements of this specification and all applicable Federal, State, and Local laws, codes, and regulations, including but not limited to the regulations of the United States Environmental Protection Agency (USEPA), United States Department of Transportation (USDOT) Occupational Safety and Health Administration (OSHA), New York State Department of Environmental Conservation (NYS DEC), New York State Department of Health (NYS DOH), and the New York State Department of Labor (NYS DOL), and the New York City Department of Environmental Protection (NYC DEP), AASHTO, ACI, ANSI, DOT, NEMA, UL. The referenced regulations, standards and codes shall be of the latest revision, in effect at the time of execution of the work. Recommendations or suggestions contained within referenced regulations, codes and standards promoting employee health and safety or the overall quality of the work shall be deemed mandatory.

6) Reference to specific regulations, standards, codes, or other items in this specification which are of specific interest to Metro-North Railroad in no way relieves the Contractor of the requirement to comply with all applicable legal requirements, nor should it be construed that Metro-North Railroad, the USEPA, USDOT, NYSDEC, NYSDOH, NYSDOL, NYCDEP, or other Federal, State and City regulators are only interested in these items. Compliance with this specification does not relieve the Contractor of the obligation to comply with other applicable requirements.

7) The Contractor shall comply with all applicable laws, codes and regulations even if they are not specifically referenced herein. Failure to reference a particular code, standard, or regulation within this specification, does not relieve the Contractor from compliance with or conducting work in accordance with all applicable codes, standards, and/or regulations.

8) If an applicable law, code or regulation is more restrictive than the requirements of this specification; the Contractor shall follow the more restrictive requirements. In event of conflict between codes, regulations, standards, contract documents or specifications, the more restrictive requirements shall apply as interpreted by Metro-North Railroad. Metro-North Railroad's decision regarding applicability of the provisions applied independently or as supplemented, modified or voided, shall be final.

9) For estimating and bidding purposes, the Contractor shall assume the more restrictive method will prevail and shall prepare the bid price to reflect the more restrictive method.

10) It is the responsibility of the Contractor to ensure that all Subcontractors are familiarized with the requirements of this specification.

B. Owner's Representatives

1) The Contractor shall adhere to the requirements of this specification, any regulatory agency inspecting the work, managing agents, project managers, project engineers, or any other entities or individuals representing Metro-North Railroad.

2) Metro-North Railroad may engage the services of third parties to provide air monitoring and/or oversee work conducted by the Contractor. The Project Engineer and Environmental Monitor shall serve as representatives of Metro-North Railroad, serving the best interest of Metro-North Railroad. The Engineer and the Environmental Monitor shall report to Metro-North Railroad on matters pertaining to the work being performed and the Contractor's conformance with these specifications and regulatory requirements. Metro-North Railroad authorizes the Project Engineer and the Environmental Monitor to have free access to the work site and all work areas for the performance of duties.

3) The Contractor is hereby notified that the Engineer or the Environmental Monitor has the jurisdiction to stop the Contractor's work if he/she witnesses or observes an instance of substantial non-conformance with these specifications, the contract documents, and/or a situation that may adversely affect the health, safety, and/or wellbeing of the contractor's workforce, Metro-North Railroad's employees, Metro-North Railroad's property, the general public, and/or the environment. Work may be stopped for instances including but not limited to, non-conformance with contract documents or specifications, unsafe work practices, employee misuse or non-use of appropriate personal protective equipment, releases or emissions resulting from the work, use of materials or equipment other than those submitted and approved for use, work not meeting the satisfaction or standard of quality of Metro-North Railroad or the Engineer. The Contractor shall not resume work until corrective measures have been implemented meeting the satisfaction of Metro-North Railroad, the Engineer, and the Environmental Monitor.

C. Use of Subcontractors

1) The Contractor shall submit required submittals for each proposed lead abatement or demolition Subcontractor to Metro-North Railroad Office of System Safety Department for review and approval prior to using any subcontractor(s) to perform any of the specified work.

2) Subcontractors shall be required to perform work in compliance with these specifications and applicable regulations and standards.

1.04 Submittals

A. General

Certain lead specific submittals will be required prior to the start of any work. The Contractor shall make these and any other required submittals in conformance with Part 3 of these specifications in advance of the work, allowing sufficient time for review and revision. In addition to the submittals required herein, the Contractor is hereby given notice that the Contractor's Corporate Health and Safety Plan, Respiratory Protection Plan, Personal Protective Equipment (PPE) Plan and Hazardous Communication Program as well as scope specific submittals other are mandatory submittals as required by these Specifications and will be reviewed separately. The Metro North Lead Projects Submittal Outline & Checklist is attached.

B. Project – Site Specific

1) Lead Health and Safety Plan (LHASP)
2) Site Specific Work Plan & OSHA Compliance Program
3) Waste Management Plan (As per Section 01 74 19: Construction Waste Management and Disposal)
4) Worker Submittals

C. Requirements

1) The foregoing is a summary of submittals to be provided by the Contractor and applicable sub-contractors to Metro-North Railroad for review. Metro-North Railroad expects for each submittal to be complete upon submission. Metro North reserves the right to request additional submittals from the Contractor as deemed necessary.

1) Information regarding all equipment and materials to be used for the performance of the work must be submitted for Metro-North Railroad's review and approval prior to use. This shall include, at a minimum, product and technical data sheets, specification sheets, material/equipment cut sheets, samples of materials, and design drawings. Submittals shall be of sufficient detail to satisfy Metro-North Railroad's requirements.

2) The Contractor shall maintain all product and equipment data sheets and instructions at the project site.

3) The Contractor shall submit evidence of one or more individuals that have completed the SSPC C3 Competent Person/Lead Supervisor Training. The person directly responsible for the on-site supervision of the work force shall have C3 certification and shall be present on site during all lead exposure related activities.

4) At the direction of Metro-North Railroad, the Contractor shall provide additional preconstruction or post construction photos and/or photos of damages resulting from the Contractor's operations.

D. Site Specific Lead Health & Safety Plan

1) A Lead Health and Safety Plan (LHASP) shall be prepared for the work covered under this specification. This plan shall discuss the occupational health and safety aspects relevant to the construction activities to be undertaken by the Contractor.

2) The LHASP shall address the specific components of this specification and shall be reviewed by the Contractor's Certified Industrial Hygienist (CIH) prior to submission for review by Metro-North Railroad. The plan shall conform to all applicable laws, codes, rules, and regulations.

3) The LHASP shall incorporate by reference, but not be limited to, the following:

   a. OSHA 29 CFR 1910 and 29 CFR 1926, including, but not limited to 29 CFR 1926.21, 1926.62 and 1926.103.

   b. National Institute of Occupational Safety and Health (NIOSH) Pocket Guide

   c. National Institute of Occupational Safety and Health (NIOSH) Manual of Analytical Methods

   d. American Conference of Governmental Industrial Hygienist (ACGIH) Threshold Limit Values

   e. OSHA Sampling and Analytical Methods

4) The LHASP shall, at a minimum, address the following:

   a. The Contractor's policy concerning employee health and safety, A description of how the policy applies to the project including site specific information so that the plan reflects the actual site conditions and scope of work,

   b. A statement of the Contractor's understanding of the Contractor's responsibility to maintain employee health and safety and enforce implemented health and safety procedures,

   c. Responsibilities for site control, management, supervision, and enforcement of health and safety procedures shall be detailed in the plan. The Contractor shall designate an individual who will be responsible for employee health and safety and has the background and authority to know what constitutes safe practices and direct their implementation at the site,

   d. The Contractor's procedures for the protection of Contractor's employees, and employees of Metro-North Railroad, the Engineer, and Metro-North Railroad's representatives shall be detailed in the plan,

   e. The Contractor's policy and procedures for environmental protection including, prevention of air, water, and soil contamination shall be provided in site-specific detail,

   f. The Contractor shall give a description of any special provisions made for safety and health procedures for specific work requirements such as scaffolding, trenching, blasting, torch cutting, fall protection, welding, hoists, cranes, maintenance and protection of traffic, confined space entry,

   g. The plan shall review the Contractor's program for maintaining and revising the health and safety plan as needed to reflect site conditions and procedures and reassessing, re-evaluating the plan on a set schedule or as needed to maintain accuracy and applicability to the work,

   h. The plan shall include a statement regarding the review, revision, and approval of the plan by the Contractor's American Board of Industrial Hygiene, Certified Industrial Hygienist (CIH),

i. General requirements for emergency planning and contingency plans with a contact list and emergency phone numbers shall be provided,

j. Directions, maps and addresses of nearby health care facilities, fire departments and police departments shall be provided,

k. Reference to the Contractor's other written programs including the Respiratory Protection Plan and Personal Protective Equipment (PPE) Programs including selection and usage specifications, Hazardous Communication Program, and Site Specific Lead Health & Safety Compliance Program shall be incorporated in the plan,

l. A statement of conformance and methods of conformance to the plan by the Contractor, subcontractors, and site visitors shall be included in the LHASP,

m. The LHASP shall detail methods of onsite communication, the lines of communication, and establishment of an emergency contact list,

n. General requirements and the definition of the Work Zone and methods of limiting unauthorized access shall be detailed in the plan,

o. A description of the provisions that will be made for first aid and emergency medical assistance, including equipment available at the site, its accessibility for use by all, and a procedure for replacement of expended first aid materials shall be cited,

p. The plan shall provide a statement that treatment of an injured worker shall not be delayed for the reason of decontamination,

q. Procedures for reporting accidents, injuries, and incidents shall be included in the plan,

r. A description of the site specific medical surveillance program shall be included,

s. EPA's recommended "Levels of Protection" including descriptions and usage requirements shall be included,

t. Industrial hygiene practices including employee Right-To-Know and usage and availability of MSDS,

u. Details of personal exposure monitoring procedures, including a description of the tasks to be monitored, the analytes, equipment, calibration and usage requirements and reporting methods,

v. The Contractor's plan for providing sanitary facilities and clean, potable drinking water,

w. Procedures for employee hygiene and decontamination,

x. The use of safety gear including but not limited to personal protective equipment including eye protection, hearing protection, hard hats, safety shoes, respirators, protective clothing, harnesses, fall protection, fall arrest, gloves and safety belts,

y. Safe electrical procedures, including adequate lighting of work areas, maintenance of temporary circuits, use of insulated tools, ground fault circuit interruption (GFCI), lockout/tag out procedures,

z. Documentation of experience, training and certifications of the Contractor's employees, including personnel responsible for overseeing and enforcing on site safety and health procedures, the competent person, the industrial hygienist, and the American Board of Industrial Hygiene (ABIH) certified industrial hygienist,

aa. Description of the Contractor's plan for regularly scheduled safety meetings and other periodic training to ensure safe work practices, including OSHA required annual refresher training,

bb. A description of housekeeping procedures,

cc. A description of emergency egress and fire escape routes, and that each egress shall be clearly identified and not be blocked or locked,

dd. A description of means implemented for fire protection and prevention including providing fire extinguishers at the site, having scheduled fire drills, and training,

ee. Safe working practices for hot and cold environments,

E. Site Specific Work Plan & OSHA Compliance Program

1) The Contractor shall submit a detailed Site Specific Work Plan and OSHA Compliance Program (Program) per the requirements of these specifications and 29 CFR 1926.62 (e). The Program shall be site specific to the particular project being undertaken and shall describe in detail the means, methods and procedures for execution of the work and protecting employees, the surrounding community, and the environment from lead exposure during performance of the work. The program shall include a detailed discussion of the sequence of work. This shall include a description of all project related activities, from commencement through completion, providing the sequence of work attached to a work schedule or timeline estimating the anticipated duration of each task.

2) Subcontractors may be required to provide submittals separate from those provided by the Contractor.

3) The Site Specific Work Plan & OSHA Compliance Program shall be prepared in accordance with 29 CFR 1926.62 paragraph (e), which shall be carried out by all employees involved in operations which disturb or remove lead containing materials.

   a. The program shall describe the methods, procedures, processes, equipment and materials that will be implemented to reduce or eliminate employee exposure to airborne lead particulate concentration.

   b. At a minimum, the program shall address respiratory protection that is in full compliance with 29 CFR 1910.134, an emergency plan of action, methods of exposure assessment, signs to be posted in work areas, protective clothing, engineering and administrative controls, hygiene facilities and practices, decontamination, housekeeping, medical surveillance, training and other items to satisfy OSHA standards as required.

   c. The program shall be specific to the scope of work and the site conditions.

   d. A listing of the contents of the program in accordance with 29 CFR 1926.62 paragraph (e) follows. The following list is provided only as a guide to assist the Contractor in reviewing the program and is not intended to represent the full contents of a complete compliance program.

i. A summary of the project scope of work including methods of abatement and components affected by the work,

ii. A list of all individuals on the work crew. The list should include employee names, employee numbers, certification and/or training identification numbers. In addition, the employee's job description and a brief description of each employee's responsibilities shall be provided,

iii. A description of each work activity which may result in employee exposure to airborne lead particulate,

iv. A description of the specific engineering controls and work practices which will be implemented to reduce employee exposure as required under 29 CFR 1926.62 paragraph (e)(5) and Appendix B to the standard,

v. A listing of the specific equipment and materials to be utilized on the project, including catalogue cut sheets, product data sheets, product information, product specifications, manufacturer instructions and recommendations for use, Material Safety Data Sheets, and any other information pertinent to the functioning and use of the product,

vi. A description of maintenance practices which ensure the proper functioning of equipment used to reduce airborne lead particulate concentrations and employee exposure,

vii. A description of the administrative controls implemented to reduce employee exposure to airborne lead particulate including a discussion of the procedures, schedule, record keeping, of employee and/or task rotation that will be utilized,

viii. A description of the technology considered to reduce employee exposure below the Permissible Exposure Limit (PEL),

ix. A description of the respiratory protection to be utilized on the project, including catalogue cut sheets, product data sheets, specifications, assigned protection factors and recommendations for use. The Contractor shall indicate which respirator will be utilized by employees for each specific task which may result in employee exposure,

x. A description of the personal protective equipment (PPE) to be utilized on the project, including catalogue cut sheets, product data sheets, specifications and recommendations for use. The Contractor is hereby notified that with regard to disposable coveralls; the use of spun bound polypropylene garments is prohibited.

xi. All personal exposure monitoring data compiled during the course of the project shall be maintained at the project site from the onset of the project through project completion. It is the responsibility of the Contractor to ensure that exposure assessment data is collected in accordance with OSHA and NIOSH recommendations for personal exposure assessment and is representative of the actual exposure incurred by the employee(s). The Contractor shall conduct the initial exposure assessments in accordance with 29 CFR 1926.62 paragraph (d). Furthermore, the Contractor shall conduct the initial exposure assessment requirement under 29 CFR 1926.62 paragraph (d) for a minimum of three (3) or more work shifts. The initial exposure assessment data shall be representative of the highest exposure incurred by an employee conducting each potential lead exposure task. During the course of the project, should there be a change of personnel, work practices, types of equipment, processes, or other factor that may affect exposure rates, the initial exposure assessment shall be repeated. Following the initial exposure assessment period,

the schedule of personal exposure assessments shall comply with 29 CFR 1926.62 paragraph (d). Personal exposure assessments shall be conducted over the entire work shift. The Contractor is hereby notified that Metro-North Railroad does not accept historical data in lieu of conducting personal exposure assessments.

xii. A description of the schedule for inspections for the work site, equipment, and materials to be made by the competent person shall be provided. In accordance with the requirements of 29 CFR 1926.62, Metro-North Railroad requires that the designated competent person be physically on site during all lead related work activities. The Contractor shall include a sample of the inspection checklist or compliance report to be completed by the competent person and shall describe the frequency of inspections.

xiii. A description of the housekeeping procedures that will be implemented at the work site to maintain surfaces as free as practicable from accumulations of lead.

xiv. A description of the personal hygiene facilities which will be provided and the hygiene practices to be followed by employees. In addition to the requirements of 29 CFR 1926.62, the Contractor shall provide complete decontamination facilities on projects involving tasks that are known or suspected of resulting in employee exposure to airborne lead particulate in excess of the Permissible Exposure Limit (PEL). The Contractor shall describe in detail the operation, maintenance, and cleaning of facilities and provide manufacturer catalogue cut sheets, product data sheets, instructions and recommendations for use.

xv. A description of the implementation schedule of the program on the project.

xvi. The compliance program shall include a statement in accordance with 29 CFR 1926.62 paragraph (e)(2)(v) that the program will be reviewed and revised as necessary at six (6) month intervals.

xvii. The compliance program shall include a statement the program will be available on the work site and available at all times for review by employees, the competent person, OSHA, Metro-North Railroad, the Environmental Monitor, and any other entity affected by the work.

F. Site Specific Waste Management Plan

a. The Contractor shall provide a written Waste Management Plan as per Section 01 74 19: Construction Waste Management and Disposal, which addresses the proper collection, handling and storage of all waste. Waste includes paint waste, potentially contaminated materials, containment materials, personal protective equipment, construction debris, scrap steel, spent solvents, and any other hazardous or non-hazardous wastes generated during the project.

b. Unless otherwise directed, only hazardous and non-hazardous waste generated directly from lead remediation activities will be transported and disposed of by Metro-North Railroad's contracted waste disposal company. Metro-North Railroad shall contract, separately, the transportation and disposal of all hazardous and non-hazardous waste. The contractor shall provide drums for debris generated.

c. The following information shall be included in the Waste Management Plan:

i. The Contractor shall provide the procedures that will be followed for the collection, site handling, storage, packaging and labeling of the waste.

ii. If solvents are designated for reuse rather than disposal, the Contractor shall provide a solvent handling plan which includes the procedures that will be followed to control and track the solvents while on site, and between the work site and the final destination.

iii. The Contractor shall provide a detailed Emergency Response and Contingency Plan which addresses worker training and the notification, clean up, and reporting in the event of a spill per these specifications. The Contractor shall comply with the requirements for implementation of the Emergency Response and Contingency Plan in the event of releases which may impact the public or the environment.

d. Transporter Information

i. Hazardous Waste Transporters

1. Metro-North Railroad shall be responsible for the transportation of hazardous wastes. Transportation of hazardous wastes is excluded from the Contractor's scope of work.

2. The Contractor shall assist with coordination of the transportation of hazardous wastes with Metro-North Railroad and Metro-North Railroad's representatives designated to arrange for the transportation of hazardous wastes. Coordination efforts shall include assistance with the inventory and scheduling for delivery and pick-up of roll-off containers and/or pick-up of drummed wastes. Contractor in all related cases shall ensure ready access to drums and other containers scheduled for pick-up and disposal.

ii. Non-Hazardous Waste Transporters

i. The Contractor shall submit the name, address, qualifications, and experience of each proposed hauler of construction debris, scrap steel, and filtered, non-hazardous wastewater.

ii. The Contractor shall provide the following information pertaining to the facility:

a. Any violation of any legal requirement in the last five (5) years relating to the protection of the environment, and describe any such notice of violation and status;

b. Any notification of any claim pertaining to investigation or remediation of any hazardous substance at the facility or;

c. Any request for information or other inquiry from a governmental entity or private party relating to the release or potential release of any hazardous substances at the facility.

e. Scrap Steel

a. The Contractor shall identify the entity proposed for handling scrap steel for disposal and the method(s) of disposal that will be used. The Contractor shall provide the entity written notification that the steel is coated with lead containing paint. The Contractor shall provide a letter (attached at the end of section 3) from the entity indicating that it will accept the scrap steel coated with lead paint, is authorized to accept the scrap steel under the laws of the state of residence; has the required capability to assure that scrap steel coated with paint which contains lead and other heavy metals is re-smelted; and will ensure that the steel is destroyed in accordance with the provisions of this specification.

b. The Contractor shall provide Metro-North Railroad with the original letter signed by a legally authorized representative of the entity or facility.

f. Wastewater

a. The environmental monitor will periodically collect samples of waste water. Laboratory analysis of the waste water will determine the classification of the water as hazardous or non-hazardous.

b. The Contractor shall provide drums for waste water collection and storage prior to disposal.

c. Non- hazardous waste water shall be disposed of by the Contractor in accordance with applicable local, state and federal regulations.

d. A firm separately contracted by Metro-North Railroad shall transport and dispose of waste water classified as hazardous. Transportation of hazardous wastes, including waste water, is excluded from the Contractor's scope of work.

G. Worker Submittals

a. Certificate of Lead Awareness Training, (1926.62 (l) (2)) for each worker – Within one year of project date.
b. Lead Physical Examinations (29 CFR 1926.62 (j) (3)) for each worker – Within one year of project date.
c. Analytical results of blood analysis consisting of Blood Lead Levels and Zinc Protoporphyrin testing must be performed within 15 days of project start date,
d. Respirator Fit Tests, for each worker – Within one year of project date.
e. Medical Clearance to wear Respiratory Protection for each worker – Within one year of project date.
f. Current SSPC, C 3 / C 5 Certification for Competent Person.

H. Site Specific Containment Plan

1) The Contractor shall provide a Containment Plan for review and approval by Metro-North Railroad. The Containment Plan shall include containment working drawings, design calculations, and other information requested for review and approval by Metro-North Railroad prior to requisition of the containment system(s). The contents of the Containment Plan shall include, but not be limited to:

2) Detailed drawings stamped by a Professional Engineer licensed in the State of New York. The Professional Engineer must analyze the containment system for the effects of wind forces on the structure as well as the containment system itself and all other imposed loads. The containment system shall not induce a load on the structure which will affect the structural integrity of the structure.

3) Data, calculations, and assumptions used for the design of the containment and ventilation system and the imposed loads on the existing structure, signed by a Professional Engineer licensed in the State of New York.

4) The plan and procedures for staging, installing, moving, and removing the containment.

5) The methods and locations of attachment to the structure.

6) The methods of access that will be provided to work areas inside containment, locations of safety lines, and locations of emergency containment entryways and exits shall also be included.

7) Procedures for cleaning, securing, monitoring and removing the containment and/or protecting materials used to construct the containment at the end of each day and/or in the case of expected inclement weather during work shut downs.

8) Plans for maintaining sufficient lighting inside containment during all work operations, including inspection, and for maintaining the navigational lighting (if applicable) during the work. Procedures for maintaining sufficient exterior lighting to ensure compliance with the restrictions on emissions and releases set forth in this specification, and to the extent that lighting is necessary for nighttime operations, when applicable.

9) Procedures and methods for communicating between equipment operators and workers inside containment, including the responsible foreman and Metro-North Railroad, the Engineer, or the Environmental Monitor, to provide for immediate shut-down of blasting equipment during abrasive blasting operations when necessary, and to communicate any corrective measures which need to be undertaken.

10) Plans and procedures for the collection and removal of waste and debris from within the containment.

11) Technical data sheets, specification sheets, material samples, and any other information needed to thoroughly describe the containment plan and materials proposed for use.

12) Containment drawings including detail sketches of all seams and seals, and ventilation design(s) for proper ventilation and negative pressure, including calculations and assumptions. All drawings and designs shall be in sufficient detail to allow for the proper review by Metro-North Railroad, and shall comply with the requirements of this specification.

13) Samples of containment materials and sealants, and actual methods of sealing, shall be submitted for review.

14) A statement that the Contractor will shut down operations, adjust work practices, modify containment and take other steps as necessary to comply with the results of the monitoring and the assessments of visible emissions as directed by Metro-North Railroad and/or the Environmental Monitor.

15) A written program for the observation of visible emissions during project activities, and inspections for releases or spills of dust and debris that may become deposited on surrounding equipment, property, soil, water, and sediment. Include the frequency and methods of observation and inspection that will be made, areas or work activities that will be observed, and the frequency and nature of clean up that will be undertaken. Include the name(s) and qualifications of the personnel conducting the observations and inspections, and the methods and equipment that will be used for cleanup activities.

16) A written program for visual inspection of the ground, soil, equipment, structure and other surfaces prior to commencement of the project, continuously during the project, and upon completion of the project to ensure that the ground, soil, equipment, structure and other surfaces are not and have not been affected by project activities. Include clean-up procedures that will be followed.

17) A written program identifying the procedures and methods that will be used to conduct daily and final visual cleanliness inspections and evaluations and final clean up upon completion of the project shall be submitted to Metro-North Railroad by the Contractor. These inspections are conducted to assure that the area and surrounding equipment, property, structures, ground, soil, water, sediment,

and other surfaces have been properly cleaned and are free of visible paint dust and debris, abrasives, or other contaminated debris in compliance with this specification.

18) The Contractor shall identify the solutions, detergents, solvents, etc. proposed for the cleaning of surfaces and equipment when wet wiping or washing is employed.

I. Site Specific Cleaning, Surface Preparation & Re-Coating Plan

1) The Contractor shall provide detailed, written procedures on intended methods of cleaning, surface preparation, and coating application. The Contractor shall include a description of all equipment and materials, including the equipment manufacturers' catalogue cuts, technical data sheets, specifications and instructions.

2) The Contractor shall identify the level of containment, methods of protection, or work isolation procedures that will be followed to protect surrounding structures, equipment, and property from exposure to all cleaning methods as well as those methods which will provide protection from exposure to paint, overspray, solvent materials, and general paint debris.

3) The Contractor shall describe the proposed method of chloride and ferrous salt removal.

4) The Contractor shall identify the name and chemical composition of detergents or solutions that will be used for cleaning the existing coating or for the removal of mildew. MSDS and product literature shall be submittal to Metro-North Railroad for review and approval prior to use.

5) The Contractor shall identify the type, brand name, and size of the abrasive proposed for use, if applicable. The contractor is hereby notified that only recyclable abrasive blast media and systems are approved for use on Metro-North Railroad property.

6) The contractor shall include procedures to be followed for cleaning of the primer coat prior to field painting as finish coat when specified as part of the scope of work.

7) The Contractor shall identify the coating materials to be applied and include the manufacturer's name, product names, and product numbers. Product data sheets, VOC levels, MSDS, and written application instructions including mixing requirements, specified thinners, and thinner amounts (see Coating Product Submittals) shall be provided to Metro-North Railroad for review. Metro-North Railroad reserves the right to specify the coating products to be used by the Contractor.

8) In the event of conflict between the manufacturer's technical data, specifications, or usage instructions and the requirements of this specification, the Contractor shall comply with the requirements of this specification unless the requirements of the manufacturer are more restrictive. In these cases, the Contractor shall advise Metro-North Railroad of any discrepancies in writing, and comply with Metro-North Railroad's written instruction with respect thereto.

9) The Contractor shall identify the procedures and methods of testing to be utilized to monitor the surface preparation and painting work, utilizing industry standard methods, including but not limited to compressed air cleanliness, ambient conditions, surface temperature, abrasive size and use, surface profile, degree of cleanliness, wet and dry film thickness or adhesion.

J. Project Notifications

1) The Contractor shall provide formal written notification to all local, state and/or federal agencies as required by law or as directed by the Engineer or Metro-North Railroad. The contents of the agency

notification(s) shall be submitted to Metro-North Railroad for review fifteen (15) days prior to the deadline for submittal to a specified agency.

2) The Contractor shall provide written notification to adjacent contractors informing them of the potential for exposure to lead. In the event notification is required, the Contractor shall submit the notification to Metro-North Railroad for review prior to submittal to the effected Contractor(s).

3) Should the Contractor launder personal protective clothing, the contractor shall notify the laundry and provide information on bags or containers of contaminated protective clothing and equipment as required by 29 CFR 1926.62 (g)(2)(vii)(B). The Contractor shall provide a sample of the notification to Metro-North Railroad prior to use.

K. Project Close-Out Submittals

1) Upon completion of the work, and prior to release of final payment, the Contractor shall submit the following information to Metro-North Railroad.

2) All filings, permits, variances, approvals, etc. granted to the Contractor by authorities or agencies to complete the work.

3) A complete copy of the Contractor's job log and the competent person's log.

4) All personal exposure monitoring data, including laboratory analytical data, compiled throughout the project.

5) Reports signed by a Certified Industrial Hygienist summarizing all blood testing results.

6) The Contractor shall provide copies of all documentation pertaining to the disposal of all hazardous and non-hazardous waste generated during the work, including but not limited to, a written log of the type and quantity of waste that was generated and removed from the project site, executed waste manifests/waste shipment records (if applicable), bills of lading, waste shipment records.

1.05 Related Sections

A. Section 01 74 19: Construction Waste Management

1.06 References

a. General

1) Reference of a particular code, regulation or standard shall apply to the work with the same authority as if it were included word for word in the specifications. Work shall conform to the applicable provisions of reference documents cited directly in the specifications and shall also conform to all codes, standards and specifications, or part thereof, cited in reference documents stipulated in the specifications. Unless otherwise noted, the latest editions and revisions of the referenced codes standards, specifications and other reference documents in effect during execution of the work shall govern.

2) Failure to reference a particular code, standard, or regulation within this specification, does not relieve the Contractor from compliance with or conducting work in accordance with applicable codes, standards, or regulations.

b. Regulations

Administrative Code of the City of New York

Section 1403, Part III of Chapter 57
Section 16, NYC Department of Sanitation Regulations

Codes, Rules and Regulations of the State of New York (NYCRR)

Title 6, Chapter III, Subchapter B, Air Resources
Part 211.2, Air Pollution
Parts 256 – 257, Ambient Air Quality Standards

Title 6, Chapter IV, Subchapter B, Solid and Hazardous Waste Laws
Part 364, Waste Transporter Permits
Part 370, Hazardous Waste Management
Part 371, Identification and Listing of Hazardous Wastes
Part 372, Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities
Part 373, Treatment, Storage, and Disposal Facilities
Parts 595-597, New York Rules of Releases, Registration, and Listing of Hazardous Substances

Title 6, Chapter X, New York State Pollutant Discharge of Water Resources Elimination System

New York State Department of Environmental Conservation 6 NYCRR Subparts 371-376.

Code of Federal Regulations (CFR)

29 CFR 1926, Occupational Safety and Health Regulations for the Construction Industry
29 CFR 1926.28 Personal Protective Equipment
29 CFR 1926.33 Access to Employees Exposure and Medical Records
29 CFR 1926.51, Sanitation
29 CFR 1926.55, Gases, Vapors, Fumes, Dusts, and Mists
29 CFR 1926.59 Hazard Communication
29 CFR 1926.62 Lead Exposure in Construction; Interim Final Rule Vol. 58, No. 84
29 CFR 1926.103 Respiratory Protection
29 CFR 1910.134 Respiratory Protection
29 CFR 1910.132 General Requirements for Personal Protective Equipment
29 CFR 1910.133 Eye and Face Protection

40 CFR 50, National Primary and Secondary Ambient Air Quality Standards
40 CFR 58, Ambient Air Quality Surveillance
40 CFR 60, App A, Method 9, Visual Determination of the Opacity of Emissions from Stationary Sources
40 CFR 60, App. A, Method 22, Visual Determination of Fugitive Emissions from Material Sources and Smoke Emissions from Fires
40 CFR 61, Subpart A General Provisions (Hazardous Air Pollutants Listing)
40 CFR 61,152 Standard for Waste Manufacturing, Demolition, Renovation, Spraying and Fabricating Operations.
40 CFR 241 Guidelines for the Land Disposal of Solid Wastes

40 CFR 257 Criteria for Classification of Solid Waste
40 CFR 261 Identification and Listing of Hazardous Wastes
40 CFR 261, Appendix II EPA, Toxicity Characteristic Leaching Procedure
40 CFR 262 Standards Applicable to Generators of Hazardous Waste
40 CFR 263 Standards Applicable to Transporters of Hazardous Waste
40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities
40 CFR 265 Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities
40 CFR 265, Subpart C, Preparedness and Prevention
40 CFR 265, Subpart D, Contingency Plan and Emergency Procedures
40 CFR 265.16 Personnel Training
40 CFR 268 Land Disposal Restrictions
40 CFR 302, Designation, Reportable Quantities and Notification
40 CFR 355, Emergency Planning and Notification
40 CFR 71-179, Transportation of Hazardous Materials Regulations

c. Testing Methodologies

1) Below is a partial list of test methods that may be used for verifying compliance to the specifications and/or manufacturer's technical data sheets. Other test methods not listed below may be required at Metro-North Railroad's discretion.

Federal Test Method Standard No. 141 "Paint, Varnish Lacquer and Related Materials: Sampling and Testing"

Federal Test Method 141	4091 Coarse particles and skins in oil base paints & pastes
Federal Test Method 141	6252 Self lifting test
Federal Test Method 141	4053 Non-volatile vehicle

American Society for Testing and Materials (ASTM)

ASTM-D-3925	Sampling for inspection
ASTM-D-1210	Fineness of grind
ASTM-D-2244	Color
ASTM-D-1640	Drying time
ASTM-D-523	Gloss
ASTM-D-563	Phthalic anhydride content in Resins
ASTM-D-2698	Pigment content
ASTM-D-2369	Solids by weight
ASTM-D-2697	Solids by volume
ASTM-D-4400	Sag resistance (mils)
ASTM-D-1849	Skinning
ASTM-D-562	Viscosity
ASTM-D-1475	Weight per gallon
ASTM-D-2369	VOC Content
ASTM-D-1400	Standard Test Method for Non-Destructive Measurement of Dry Film Thickness of Non-Conductive Coatings Applied to a Non-ferrous Metal Base
ASTM-D-3359	Standard Test Methods for Measuring Adhesion by Tape Test
ASTM-D-4138	Standard Test Method for Measurement of Dry Paint Thickness of Protective Coating Systems by Destructive Means
ASTM-D-4285	Standard Test Method for Indicating Oil or Water in Compressed Air
ASTM-D-4414	Standard Practice for Measurement of Wet Film Thickness by Notch Gages

ASTM-D-4417	Standard Test Methods for field Measurement of Surface Profile of Blast Cleaned Steel
ASTM-D-4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM-D-4752	Standard Test Method for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub

EPA Methods

EP/600/R-94/038b, Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods, Section 2.8 (Lead) and 2.11 (PM-10).
SW 846 Test Methods for Evaluating Solid Waste – Physical/Chemical Methods
Method 3050, Acid Digestion of Sediment, Sludge, and Soils
Method 1311 Toxicity Characteristic Leaching Procedure (TCLP)

National Institute for Occupational Health and Safety (NIOSH)

NIOSH Manual of Analytical Methods
NIOSH Method 7082, Lead

Other

American Industrial Hygiene Association (AIHA)

Environmental Lead Proficiency Analytical Testing Program (ELPAT)
Proficiency Analytical Testing Program (PAT)

American National Standards Institute (ANSI) Publications

Z88.2-1980	Practices for Respiratory Protection
Z87.1	Eye Protection

Society for Protective Coatings (SSPC)

SSPC Painting Manual-Good Painting Practice-Volume 1
SSPC Painting Manual-Systems and Specifications-Volume 2 (Eighth Edition)
SSPC-PA 2 Measurement of Dry Film Thickness with Magnetic Gages
SSPC-VIS 1 Visual Standard for Abrasive Blast Cleaned Steel
SSPC-VIS 3 Visual Standard for Hand and Power Tool Cleaned Steel
SSPC Guide 6 Guide for Containing Debris Generated During Paint Removal Operations (revised 12/01/1997)
SSPC Guide 7 Guide for the Disposal of Lead-Contaminated Surface Preparation Debris

Industrial Lead Paint Removal Handbook, 2nd Edition, Volume I (SSPC 93-02)
Project Design, Industrial Lead Paint Removal Handbook, Volume II (SSPC 94-18)
Industrial Lead Paint Abatement: Practical Techniques for Complying With Regulations (SSPC 94-02)

End of Part 1

PART 2 – PRODUCTS

2.01 Equipment Specific to Lead Abatement/Surface Preparation

A. All power tools shall be equipped with commercially available HEPA filtered local exhaust ventilation. Power tools equipped with dust collection shall be attached to HEPA filter equipped vacuums capable of providing the vacuum and airflow recommended by the tool manufacturer.

B. The Contractor shall deliver equipment to the project site in clean, working condition.

C. Equipment having HEPA filters shall be delivered to the work site with new primary and secondary filters installed prior. Removal and replacement of use filter elements after arrival to the project site is prohibited.

D. All ventilation and vacuum equipment having HEPA filtration shall be delivered to the job site with new filter media. Filtration media may be replaced on site during the course of the project, as required to maintain proper functioning of equipment and adequate filtration of exhaust air. On-site filter replacement shall be conducted within containment enclosures having operating engineering controls in place to control airborne particulate.

E. Prior to removal from the work site, the Contractor shall clean all equipment, unused materials, and other non-disposable items to be removed from the work site. Cleaning shall be accomplished via HEPA vacuuming and wet cleaning.

F. Vacuum equipment shall be equipped with HEPA filtration. Vacuum equipment shall be sized and suited to the specific type of planned usage.

G. Collection / filter bags shall be removed from all HEPA vacuums utilized on the project prior to removal from the project site. Gross debris remaining in HEPA vacuum canisters or collection tanks shall be removed via another HEPA vacuum.

H. As applicable, air filtration devices (AFDs) equipped with HEPA filters shall be provided.

I. Unless otherwise directed, used filter elements shall be disposed of as hazardous waste.

J. Prior to removal from the contained work area or project site, the inlets and outlets of dust collectors, ventilation ducts, HEPA vacuums, air filtration devices, and other contaminated equipment shall be sealed to prevent the escape of any debris remaining within the equipment.

End of Part 2

PART 3 – EXECUTION

3.01 Lead Health & Safety

A. Airborne Dust & Particulate Control

1) The Contractor shall implement engineering controls to minimize the generation of airborne particulate.

2) Dust control measures may include wetting of surfaces, the use of HEPA filter equipped mechanical ventilation, or other methods approved by Metro-North Railroad.

3) In accordance with 29 CFR 1926.62 paragraph (e), the Contractor shall implement work practices and engineering controls to reduce employee exposure to lead particulate as the primary means of protecting employees from exposure to lead particulate.

4) The Contractor shall immediately cease work should equipment crucial to maintaining employee health and safety become defective or not be functioning properly.

5) The following work practices/methods are prohibited:

i. Dry sweeping / broom use
ii. Un-contained, open abrasive blasting,
iii. Un-contained use of compressed air to blow down or remove dust from surfaces,
iv. Use of power tools not equipped with HEPA filter equipped local exhaust ventilation.
v. Use of heat guns or open flame to remove coatings.

B. Health & Safety Requirements

1) Competent Person

i. The Contractor shall provide a competent person responsible to perform the duties required by 29 CFR 1926.62. The competent person shall be present on site during all lead related activities. The designated competent person shall be responsible for examination and evaluation of equipment utilized to minimize worker exposure, employee work practices, and personal protective equipment. Other responsibilities shall include, but are not limited to:

1. Maintain a permanently bound daily entry job log, signed by all individuals who enter and leave the site. The log shall record the Contractor, the specific work area, name and signature of the person, Metro-North Railroad's contract number and the type of respiratory protection utilized by the worker. The daily entry logbook shall be available for inspection by Metro-North Railroad throughout the project.

2. Maintaining a project inspection log recording daily events, work progress and unusual events during the course of the work. This log shall remain on-site and be made available to Metro-North Railroad upon request.

ii. The competent person shall have successfully completed the Society for Protective Coatings (SSPC) C-3 Supervisor/Competent Person Training For De-leading of Industrial Structures.

2) Certified Industrial Hygienist

i. The Contractor shall retain the services of a Certified Industrial Hygienist (CIH) holding current certification by the American Board of Industrial Hygiene (ABIH) with at least one (1) year experience on hazardous waste operations. The certified industrial hygienist shall be involved in the preparation of all health and safety related submittals and shall review and approve the Contractor's submittals prior to submission to Metro-North Railroad. The Contractor shall arrange for inspections of the project site by the CIH. At a minimum, site inspections shall be conducted by the CIH during the initial phases of the lead related tasks.

3.02 Work Area Segregation & Preparation

A. Work Area Segregation & Preparation

1) The Contractor shall establish the perimeter boundaries of the work zone. The perimeter of an active work area shall be demarcated by "caution tape" and lead hazard signs consistent with 29 CFR 1926.62 paragraph (m). The work zone shall include the entire area utilized by the Contractor to perform the work. If site conditions allow, an additional exclusion zone extending twenty-five (25) feet from the perimeter of the work zone shall be established. The exclusion zone shall be demarcated by "caution tape" and lead hazard signs consistent with 29 CFR 1926.62 paragraph (m).

2) Lead hazard signs consistent with 29 CFR 1926.62 paragraph (m) shall be posted in accordance with OSHA requirements and at all points of entry to the work zone(s), containment(s), and the decontamination facility. Signs utilized outdoors and exposed to the weather elements shall be weatherproof or otherwise protected from damage and fading. The Contractor shall maintain or replace signs as needed to maintain effectiveness throughout the work.

3) The Contractor shall install temporary fencing enclosing the work zone, or exclusion zone, preventing access of unauthorized personnel. The Contractor shall maintain the fencing as needed to maintain its integrity throughout the work.

4) Access to the work area shall be restricted to Metro-North Railroad, the Contractor, Contract personnel, and other authorized personnel who have donned the appropriate personal protective equipment, have received the appropriate training in respiratory protection and lead exposure hazards, and are familiar with the decontamination procedures specified herein.

5) The Contractor shall request approval from Metro-North Railroad for any person not directly involved in the project, to enter the work area. Only upon Metro-North Railroad's approval shall such persons be allowed to enter the work zone.

B. Requirements For The Establishment of Exclusion Zones

1) The Contractor shall establish regulated areas, or exclusion zones, around areas or activities which may produce airborne emissions of lead in excess of the applicable Action Level.

2) Based upon observations and/or air monitoring conducted by the Environmental Monitor, Metro-North Railroad may require the Contractor to expand the exclusion zones beyond initial boundaries.

3) The Contractor shall provide the Environmental Monitor with a list of workers daily to ensure that all workers who enter the regulated area have had the proper training, blood analysis and medical examinations, and are wearing the required protective clothing and equipment.

4) The Contractor shall prohibit eating, drinking, smoking, and chewing tobacco products in any area where the exposures exceed the Action Level.

C. Signs

1) The Contractor shall post caution signs around the regulated area. Signs must be posted to adequately inform employees of the potential exposure to lead and the need for personal protective equipment. Signs are to be clearly visible during all hours, cleaned as necessary, and positioned as to be easily visible from all routinely used approaches to the lead work area. Signs shall be in compliance with the requirements of 29 CFR 1926.62.

2) The Contractor shall use signs that are a minimum of 8 1/2 inches by 11 inches in size with black block lettering on a white, yellow, or orange background. Signs shall display the following message:

WARNING
LEAD WORK AREA
POISON
NO EATING OR SMOKING

3.03 Specific Lead Abatement Methodologies & Procedures

A. Available Lead Abatement Methodologies

1) The Contractor shall employ one or a combination of lead abatement methods to satisfy Metro-North Railroad‘s requirements depending on the project specific scope of work. Metro-North Railroad reserves the right to accept or reject specific lead abatement methodologies based upon the health and safety, and environmental risks posed to employees performing the work, adjacent occupants, communities, and the public, the Contractor’s experience with performing a specific method, the potential quantities and types of waste resulting from the method, the noise, fumes, and/or odors associated with the specific method, and any other concerns.

2) The following are the currently available and accepted methods of abating lead painted surfaces:

a. Removal of paint from components or building materials:

i. Paint removal shall be known as the complete removal of all visible paint from the substrate. Paint removal may be accomplished utilizing one or a combination of available methods, such as, chemical stripping, power tool cleaning utilizing mechanical surface preparation tools equipped with HEPA filtered local exhaust ventilation, contained abrasive blast cleaning, wet abrasive blast cleaning, or other suitable means submitted by the Contractor and approved for use by Metro-North Railroad.

b. Removal and replacement of components or building materials having lead containing paints, in their entirety:

i. Removal and replacement of lead painted components or building materials shall include the removal of lead based painted components or building materials in their entirety and replacement with similar non-lead based painted components of equal or greater quality. Metro-North Railroad reserves the right to accept or reject replacement materials based upon comparative quality and durability, aesthetic nature and physical attributes, form and function, and the overall suitability of the product for its intended use.

c. Encapsulation of lead based painted surfaces:

i. Encapsulation of lead based painted components or building materials shall include the covering of a lead based painted surface with a coating product, which is applied in a liquid state and then cures to provide a protective film over the underlying lead based painted surface.

d. Enclosure of lead based painted surfaces:

i. Enclosure of lead based painted components or building materials shall include the covering of a lead based painted surface with a rigid building material creating a physical barrier between the underlying lead based painted surface and the area in which the component is located. Enclosure typically involves encasement of a lead based painted surface with gypsum board, paneling, metal sheeting, etc.

B. Surface Preparation & Paint Removal

1) The Contractor may utilize a combination of surface preparation methods described in this specification or otherwise approved by Metro-North Railroad.

2) The Contractor shall not perform any work which requires the disturbance of a lead containing material without the prior authorization of Metro-North Railroad.

3) The Contractor shall perform a demonstration of the cleaning method for Metro-North Railroad to demonstrate the effectiveness of the proposed method of surface preparation.

4) Prior to torch cutting, open flame burning, rivet/bolt busting, or other impact or abrasive related work which may cause lead particulate releases, all visible paint within six (6) inches of the area of disturbance shall be removed, as technologically feasible.

5) All paint chips, paint removal material, and any other debris generated in the cleaning process shall be contained, captured, collected and disposed of in accordance with the provisions set forth in this specification.

C. Abatement of Lead - Containing Paint – Interior Locations

1) Prior to the start of work, all movable objects shall be removed from the work area. All movable objects remaining within the work area at the start of the project shall be considered contaminated unless otherwise determined by Metro-North Railroad. Prior to removal from the work area, and at the direction of Metro-North Railroad, potentially contaminated movable objects shall either be cleaned via approved methods outlined in this specification or methods proposed by the Contractor and approved by Metro-North Railroad or discarded. Upon completion of cleaning, movable objects shall be removed from the work area, and stored in non-contaminated areas outside of the boundaries of the work area. Objects remaining in the work area shall be isolated from the remainder of the work area. At the direction of Metro-North Railroad, the Contractor shall construct a rigid, sealed, enclosure surrounding the items as necessary to protect items from damage during the work.

2) Interior lead-containing paint abatement, including demolition and surface preparation of lead based painted surfaces, shall be contained. Containment for interior lead abatement will require the installation of critical barriers. At a minimum, containment barriers shall be constructed of two (2) layers of six (6) mil poly sheeting. Reinforced poly shall be used to protect floor surfaces.

3) Containment shall prevent the migration of particulate to areas or locations outside the work area. Should an entire area, room, etc. be the work area, containment barriers may be limited to doors, windows, ducts, registers, grilles, or other penetrations to the work area. Critical barriers shall be installed as necessary to isolate components not included in the scope of work.

4) The entry to the work area shall be equipped with an airlock entryway. The airlock entryway shall have a minimum of four (4) feet between airlock flap doors and shall have dimensions large enough to allow for the passage of all movable objects to be removed from the work area, and all materials, tools, equipment necessary to complete the work. The airlock shall be cleaned regularly and walk-off mats shall be installed in the airlock to prevent tracking of dust outside of the work area.

5) In the event the space contains heating, ventilation and air conditioning (HVAC) equipment, the following procedures shall be followed.

   a. If the HVAC system supplies only the active work area and no other areas adjacent to the work area, the HVAC system shall be blanked at the system's entrance to the work area.

   b. If HVAC equipment runs through the work area supplying occupied areas adjacent to, but outside of the boundaries of the work area, the HVAC system shall remain in operation but be completely sealed.

   c. Supply diffusers and return grilles, shall be cleaned and sealed. All seams in the ducting systems shall be cleaned and sealed. The exterior of the ducts running through the work area shall be cleaned as part of the final cleaning, prior to project completion.

6) Electrical, mechanical and other non-moveable equipment within the work area shall be framed out with solid, load bearing barriers of 3/8" thickness or greater. Equipment which must remain operational during the work shall be segregated with a solid rigid barrier and isolated from the work area. Equipment shall be ventilated via a flex duct system brought from outside of the work area.

7) Unless otherwise directed, light fixtures shall remain in place and be securely wrapped with a single layer of 6 mil poly.

8) Mechanical ventilation shall be implemented as an engineering control to reduce employee exposures to airborne particulate during the work. A sufficient quantity of HEPA filter equipped air filtration devices shall be installed to provide a minimum of twelve (12) air changes per hour in the active work area during surface preparation, demolition, or other disturbance of lead containing materials. Air filtration devices shall be located as far as possible from the entry/egress to the work area(s), or other locations of make-up air, to create a cross draft through the work area. Air filtration devices shall be exhausted outside of the work area.

9) The Contractor shall implement additional engineering controls and good work practices such as wetting or misting of surfaces and/or localized exhaust ventilation as necessary to minimize the generation of airborne particulate throughout the work.

D. Cleaning Methods & Procedures

1) General

a. Cleaning of surfaces shall be accomplished via HEPA filter equipped vacuums, and wet wiping,. The Contractor shall identify the specific methods proposed for the cleaning of surfaces and the equipment to be utilized.

2) HEPA Vacuuming

a. HEPA vacuuming shall be utilized to remove, recover, and collect debris. Dry brushing, wiping, sweeping, blowing via compressed air, or other methods resulting in the generation of airborne particulate are prohibited. The vacuum equipment shall be properly sized to the specific task being employed. Recovery of spent abrasive blast media shall be conducted utilizing industrial grade vacuum equipment.

b. HEPA vacuum attachments shall be manufactured by, or approved for use by, the HEPA vacuum manufacturer.

c. The Contractor's site supervisor shall be responsible for the proper operation and maintenance of vacuum equipment and shall review the proper use of equipment and attachments with the work force. .

3) Wet Cleaning Procedures

a. Wet wiping of surfaces shall be conducted using detergent approved by Metro-North Railroad prior to use.

b. The surface shall be deemed "clean" when visible surface contamination can no longer be removed from the surface. No visible detergent residue or streaking from contamination shall remain on the surface.

c. Unless otherwise directed, upon completion of wet wiping, all surfaces shall be rinsed with clean water.

d. All wastewater generated during wet wiping shall be handled in accordance with the waste handling section of these specifications.

e. Care shall be taken to avoid excessive accumulation or pooling of water within work areas. Accumulated water shall be extracted via wet/dry HEPA vacuums or absorbed with sponges or towels.

f. The Contractor shall install dehumidification equipment as necessary to lower the moisture content of building materials to acceptable levels prior to coating application.

g. Surfaces shall be allowed to thoroughly dry prior to application of coatings.

4) Cleaning Carpeted Surfaces

a. Carpet specified for removal shall have visible paint debris removed via HEPA vacuuming. Carpet shall be removed after area work area preparation / isolation has been accomplished.

b. Carpet specified to remain shall be HEPA vacuumed utilizing HEPA vacuums designed for carpeted floor surfaces and having a power head with rotating agitator or beater brush. No exceptions to this requirement will be made.

c. Commercial cleaning of carpet may be implemented upon prior approval from Metro-North Railroad.

5) Cleaning Concrete and Other Rough Surfaces

a. Upon approval of Metro-North Railroad, the Contractor may utilize commercially available equipment specifically designed to pressure wash and recover water simultaneously for cleaning concrete or similar rough surfaces.

E. Demolition of Lead-containing Components

1) Prior to demolition of materials coated with lead containing coating, all loose, peeling, non-adhering paint shall be removed from the components specified for demolition. Paint removal shall meet the requirements of an SSPC SP2 Hand Tool Cleaning.

2) The Contractor shall implement engineering controls and good work practices to reduce the generation of airborne lead particulate. Surfaces shall be wetted prior and during surface preparation and demolition. Mechanical ventilation equipped with HEPA filtration shall be utilized to ventilate the work area.

3) Disposal requirements for lead based painted building components shall be determined via laboratory analysis of representative samples of the waste stream via EPA Methods 1311/6010 (TCLP Lead).

F. Demolition / Dismantling of Steel Components Having Lead Containing Paint

1) Steel repair, replacement, reinforcement, or rehabilitation involving the disturbance of coatings shall be conducted as described in this section and in accordance with 29 CFR 1926.62, 29 CFR Subpart J Welding and Cutting, and specifically 1926.353 Ventilation & Protection: Welding, Cutting, and Heating and 1926.354 Welding, Cutting, and Heating in Way of Preservative Coatings.

2) Prior to demolition of coated steel components, all loose, peeling, non-adhering paint shall be removed from the components specified for demolition. Paint removal shall meet the requirements of an SSPC SP2 Hand Tool Cleaning.

3) At a minimum, existing coatings within six (6) inches of each location at which disturbance will occur shall be removed prior to disturbance. "Disturbance" includes: rivet busting, thermal cutting, welding, grinding, or other methods known to result in worker exposure to lead. Use of sheering methods in substitution of "hot methods" is recommended as an alternative method.

4) If the component is double sided and both faces are painted, paint within six (6) inches of each location at which disturbance will occur, shall be removed from both sides of the component.

5) All visible coatings, shall be removed exposing the underlying steel substrate.

G. Thermal Cutting, Torch Cutting, Burning, Welding & Other "Hot" Work

1) Steel repair, replacement, reinforcement, or rehabilitation involving the disturbance of coatings shall be conducted as described in this section and in accordance with 29 CFR 1926.62, 29 CFR Subpart J Welding and Cutting, and specifically 1926.353 Ventilation & Protection: Welding, Cutting, and Heating and 1926.354 Welding, Cutting, and Heating in Way of Preservative Coatings.

2) At a minimum, existing coatings within six (6) inches of each location at which disturbance will occur shall be removed prior to disturbance. "Disturbance" includes: rivet busting, thermal cutting, welding, grinding without HEPA filtered local exhaust ventilation, or other methods known to result in the generation of airborne particulate or suspected to result in worker exposure.

3) If the component is double sided and both faces are painted, paint within six (6) inches of each location at which disturbance will occur, shall be removed from both sides of the component. "Cut lines" require six inches on either side of cut for a total of 12 inches abated at the cut line point.

4) All visible coatings shall be removed exposing the underlying steel substrate.

5) The Contractor may accomplish removal of coatings utilizing one or a combination of the following methods:

   a. Use of sheering methods as an alternative method to reduce exposure to airborne contaminants is recommended.

b. The use of chemical stripping agents containing methylene chloride is prohibited.

c. Power tool cleaning with HEPA filtered attachment, resulting in an SSPC SP3/SP11 degree of cleanliness, may be utilized.

d. Alternative methods submitted by the Contractor and approved by Metro-North Railroad may be utilized.

6) Employees performing "hot work" shall retain current city and state certifications applicable to performance of the work.

7) Upon completion of coating removal via the requirements in this specification, the Contractor shall implement the additional controls specified below.

8) Demolition of steel components via thermal cutting, torch cutting, burning shall be accomplished utilizing "demolition torches" having a three (3) foot lance length or greater.

9) The Contractor shall implement the following combined engineering controls during thermal cutting, torch cutting, burning, welding, & other "hot work".

a. Local exhaust ventilation equipped with HEPA filtration to locally "capture" metal fume at the point of generation

b. Mechanical ventilation to disperse metal fume within the employee's work zone.

10) Employees performing thermal cutting, torch cutting, burning, welding, & other "hot work", after lead containing coating removal, shall use personal protective equipment suitable to the specific task to be completed. Personal protective equipment shall include but not be limited to, respiratory protection having an Assigned Protection Factor (APF) of fifty (50) times the Permissible Exposure Limit until personal exposure monitoring data demonstrates otherwise. Hygiene facilities compliant with 29 CFR 1926.62 shall be provided. Until exposure assessments are completed, complete decontamination facilities equipped with showers shall be provided. At no time shall the respiratory protection for employees performing thermal cutting, torch cutting, burning, welding, & other "hot work", after lead containing coating removal, be downgraded below an Assigned Protection Factor (APF) of ten (10) times the Permissible Exposure Limit.

3.04 Containment

A. Containment General

1) The degree of containment required shall be consistent with the needs of the site-specific work scope. The Contractor shall utilize SSPC Guide 6 in determining containment design requirements. The Contractor is responsible for consulting Metro-North Railroad in determining specific information on the structural limitations of the structure to be worked and the structural requirements for the containment itself. Unless otherwise directed, containments within or adjacent to the rail traffic envelope shall be capable of withstanding a one hundred (100) mile per hour wind loading and a minimum load carrying capacity of two hundred pounds per square foot (200 lbs/ft^2).

B. Containment Components

1) Materials: All containment materials and materials used for sealing of the containment shall be resistant to water, chemicals, and the anticipated exposure/weathering and shall be able to perform as intended when exposed to such elements. Rigid containment materials consist of solid panels of plywood, aluminum, rigid metal, plastic, fiberglass, composites, or similar materials. Flexible materials consist of screens, tarps, drapes, plastic sheeting, or similar materials. Fire resistant materials shall be used for containments, as applicable.

2) Support structure: Rigid support structures may consist of scaffolding and framing to which the containment materials are affixed or similar types of materials and configurations. Flexible support structures will be constructed of cables, chains, or similar systems to which the containment materials are affixed.

3) Joints: Approved joint sealing methods include tape, caulk, Velcro, zippers, clamps, or other similar material capable of forming a continuous, impenetrable seal. The use of overlapping containment materials (1 foot minimum overlap) to achieve fully sealed joints is acceptable only when emissions of dust and debris are adequately controlled.

4) Airlock Entryway: Re-sealable door entryways shall include the use of flexible or rigid doors capable of being repeatedly opened and resealed. Approved sealing methods include zippers, Velcro, clamps, or similar fasteners.

C. Lighting

1) The Contractor shall maintain all warning beacons and other warning lighting on the structure throughout the work .

2) Flexible containment materials shall consist of a light transmissive material which allow natural light into the containment during daytime hours and artificial light during nighttime hours.

3) Lighting within work areas and containments shall meet the requirements of SSPC-Guide 12 *Guide for Illumination of Industrial Painting Projects.* In strict accordance with SSPC Guide-12, lighting intensity on the steel surface, by natural or artificial means, shall be maintained at a minimum of 200 foot candles, throughout surface preparation, painting, and inspection. The Contractor shall supply a portable light meter to verify compliance with this specification.

4) The Contractor shall provide adequate artificial lighting for all methods of cleaning, paint application, and inspection work. The use of blast nozzle mounted lighting is recommended to supplement general containment lighting. The Contractor shall not solely rely upon blast nozzle mounted lighting for illumination.

5) Exterior lighting shall be sufficient to allow for visible assessment of emissions from all sides of the containment and environmental control equipment. All exterior sides of the containment and filtration equipment shall be sufficiently illuminated to allow for visual assessment of emissions during nighttime hours.

6) Lighting deemed insufficient by Metro-North Railroad or their representatives shall be grounds for work stoppage until remedial action is taken and the work area is sufficiently illuminated.

D. Ventilation

1) Ventilation: Local exhaust ventilation or mechanical ventilation shall be implemented to the degree compatible with the method of surface preparation employed.

a. Local Exhaust Ventilation

i. The Contractor shall provide suitable local exhaust ventilation for use with shrouded power tools and/or during "hot work". Local exhaust ventilation equipment shall discharge air through a HEPA filter. Local exhaust ventilation equipment shall be adequately sized to accommodate the operation. The hose connecting the ventilation equipment to the tool shall be properly sized and the length maintained to distances allowing for adequate exhaust ventilation at the point of use.

ii. The Contractor shall provide filtration of the exhaust air with a filtration efficiency of 0.3 microns or better, in order to prevent airborne particulate from being exhausted into the surrounding air.

b. Mechanical Ventilation

i. The Contractor shall provide mechanical ventilation of Class 1A containment(s) as necessary to provide adequate ventilation based upon containment size. A minimum average cross draft velocity of 120 feet per minute and/or average downdraft velocity of 70 feet per minute shall be maintained during blasting and cleaning operations.

ii. When mechanical ventilation systems are used, the Contractor shall provide filtration of the exhaust air with a filtration efficiency of 0.5 microns or better.

iii. The Contractor shall verify negative pressure through instrument monitoring to achieve a minimum of 0.03 in. (7.5 mm) water column (W.C.) relative to ambient conditions, or through visual assessments for the concave appearance of the containment enclosure.

iv. Work areas shall be adequately ventilated during use of solvent borne materials in accordance with the MSDS of products utilized. In the event ventilation cannot be maintained as recommended on the MSDS, the Contractor shall provide employees with suitable respiratory protection equipment.

E. Pre-Work Inspection & Construction Verification

1) <u>Containment Construction Certification</u>

a. Upon completion of installation of the containment system and prior to the start of surface preparation activities, the Contractor shall conduct an inspection of the containment system as built and certify that the containment system has been

assembled as shown on the approved, signed and sealed engineered drawings. The certification shall be submitted to Metro-North.

b. If the containment is not constructed in accordance with the design drawings, the Contractor's design engineer shall issue supplemental calculations for the new design for review and approval in accordance with the original submittal requirements. After supplemental calculations have been reviewed and approved by Metro-North Railroad, the Contractor shall conduct a new containment inspection and certify that the containment system has been assembled as shown by the supplemental calculations. This certification shall be submitted to Metro-North Railroad.

2) Pre-Surface Preparation Inspection

a. The Contractor shall notify Metro-North Railroad two (2) days in advance of the intended date of completion of erection/installation of the containment system. Upon completion of containment installation, Metro-North Railroad, the Engineer, and the environmental monitor shall conduct a "Pre-Surface Preparation Inspection" verifying containment construction meets the requirements of the specification and is constructed per the approved containment plan. Sealing, ventilation, and illumination, among other design parameters, will be investigated. Should the containment fail to meet the specified requirements, the Contractor shall take all necessary actions to correct discrepancies or deficiencies. Additional "Pre-Surface Preparation Inspections" shall be conducted as necessary until conformance to the specifications and containment plan submittals is achieved.

F. Routine Cleaning & Maintenance

1) Preventative Measures & Daily Routine Cleaning

a. The Contractor shall prevent dust, solvents, paint, paint chips, and debris from being released or spilled into the soil, water, sediment, or storm sewers.

b. The Contractor shall replace worn or damaged materials and/or equipment as necessary or as directed by Metro-North Railroad to maintain the integrity of environmental controls and protection. This shall include replacement of worn or damaged containment tarpaulins as necessary to maintain their effectiveness.

c. The Contractor shall conduct work site clean-up during and after the project, including the removal of pre-existing litter or debris the distance of two times the height of the containment in all directions surrounding the containment.

2) Cleaning & Securing Containment

a. The Contractor shall clean and secure the containment materials and equipment at the following times: the end of each work shift, prior to relocation or moving to another point along the structure, when the containment will be unmanned, and when inclement weather is forecast.

b. Cleaning shall be accomplished via vacuums equipped with HEPA filtration.

c. The Contractor shall clean all loose debris from within the containment and containment materials and equipment to the extent that dust or debris is not dislodged, by physical contact and to prevent emissions during moving of the containment or non-working hours.

d. The Contractor shall clean all containment materials and equipment prior to moving or removing materials and equipment from the site.

e. The Contractor shall thoroughly HEPA vacuum, wet wipe, or otherwise decontaminate reusable items until all loose surface dust and debris have been removed. Items requiring cleaning include, but are not limited to, paint removal and ventilation equipment, containment materials, ground covers, scaffolding, work platforms, fasteners, etc.

f. If adequate cleaning is not possible, the Contractor shall treat the materials as a separate waste stream and containerize for testing and disposal in conformance with this specification.

g. When the containment is unmanned and/or inclement weather is forecast, the Contractor shall shut down operations, perform cleanup as required herein and secure the containment and equipment as a safeguard against winds or inclement weather.

h. The Contractor shall coordinate all containment cleaning and securing activities described herein with Metro-North Railroad.

3) Containment Maintenance During Inclement Weather or Non-Working Hours

a. The Contractor shall assign personnel to inspect and secure the containment, platform, and its components during inclement weather conditions and non-working hours. Non-working hours include all times when the containment is unmanned, including without limitation weekends, holidays and other extended shut down periods.

b. During extended shut down periods the Contractor shall inspect the containment, scaffold, work platform, and other related components at least one (1) time per week for damage and/or defects.

c. At all times, during working and non-working hours, the Contractor shall correct any potentially unsafe condition, including but not limited to repairing any deficiencies and/or defects, securing any torn or loose containment components and removing any excessive loadings to safeguard the structure, surrounding property, and the general public.

G. Final Cleaning & Clearance

1) The Contractor shall undertake a final, thorough inspection and cleanup of the project site and surrounding area within two (2) days of completion of project activities.

2) After all Contractor equipment and materials have been removed, the Contractor shall conduct a visual inspection of the project site, which includes all areas used as staging and equipment yards, storage and decontamination areas, waste storage, and all surrounding areas and surfaces located within two times the height of the structure in all directions. If

project debris is observed beyond two times the height of the structure, the limits of the inspection shall be increased, as directed by Metro-North Railroad.

3) The Contractor shall thoroughly inspect the area and surfaces for the presence of visible debris and waste. This includes, but is not limited to, lead dust, spent abrasives or other paint removal media, paint chips, solvents, materials of construction, fuel, and other litter. In the areas and surfaces subject to inspection, the Contractor shall clean up and remove debris and wastes to the satisfaction of Metro-North Railroad even if the debris and waste are a pre-existing condition.

4) Cleaning will include manually removing paint chips, by HEPA vacuuming, and/or wet wiping or washing, as directed by Metro-North Railroad.

5) Clean the surrounding water with the use of approved materials and equipment including but not limited to water booms and/or boats with skimmers, as directed by Metro-North Railroad.

3.05 Environmental Monitoring

A. Clearance Inspections Final Report

1) The Contractor shall prepare a report presenting the results of the inspections conducted to verify the final cleanliness of the project site, surrounding property, waterways, equipment, buildings, and structures within one (1) week of the inspection performed in accordance with this specification.

2) The Contractor shall include a summary of any problems or releases that occurred during the project, and the cleanup and corrective action measures that were taken to resolve the problem.

B. Visible Emissions & Releases

1) The Contractor is required to perform his own assessments of visible emissions in addition to those performed by the environmental monitor.

2) The Contractor shall conduct assessments of visible emissions as required by this specification to account for all locations where emissions of lead dust might be generated, including but not limited to, the containment, dust collection and abrasive recovery equipment, and waste containerizing areas.

3) The Contractor shall conduct observations and corrections of visible emissions on an ongoing basis.

4) In addition to maintaining the required written documentation, the Contractor shall verbally communicate the results to Metro-North Railroad on a daily basis.

5) The Contractor shall immediately cease operations and undertake corrective action to control emissions if there is a failure of mechanical ventilation or inability to maintain continuous negative pressure and/or any emissions regardless of time, duration or opacity.

6) When visible emissions or other releases are observed, in addition to cleaning the debris, the Contractor shall take the initiative to change work practices, modify the containment, or take other appropriate corrective action to prevent similar releases from occurring in the future.

C. Reporting/Documenting Visible Emissions and Releases

1) The Contractor shall report the results of the daily assessments of visible emissions and releases in a report form approved by Metro-North Railroad. At a minimum, the visible emission observation form shall include information such as the Contract number, Contractor's name, work location, date of observations, location and duration of emission, outline of the visible emission criteria, notification to Metro-North Railroad, corrective actions taken, and signature block for the observer.

2) The Contractor shall document all cases where work has been halted due to visible emissions or releases, the resulting cleanup activities performed, the reason or explanation for the emission or release, and the corrective action taken to avoid a reoccurrence. The written report shall be provided to Metro-North Railroad within forty-eight (48) hours of the occurrence.

3) The Contractor shall summarize the individual reports and the corrective action taken and provide the combined information to the environmental monitor and Metro-North Railroad each month. The Contractor shall cooperate with the environmental monitor in the preparation of any reports for Metro-North Railroad.

D. General

1) Metro-North Railroad has contracted the services of a third party environmental monitor to conduct assessments of emissions and releases into the environment including air, soil and water.

2) The Contractor shall comply with the requirements for assessment of visible emissions, releases, and ambient air monitoring throughout the work.

3) The Contractor shall coordinate all monitoring activities with the environmental monitor, and cooperate with the assessments and results of the testing and inspection performed by the environmental monitor.

4) The Contractor shall comply with any directions given by the Engineer or the environmental monitor, including shut down of operations when emissions or releases violate the requirements of this specification. The Contractor shall undertake all necessary corrective action to control emissions and clean up the area.

3.06 Waste Handling

A. Submittals

1) Waste Management Plan

a. The Contractor shall provide a written Waste Management Plan. The Waste Management Plan shall address the proper collection, handling, storage, and disposal of all waste. The Waste Management Plan required under this specification is for the protection of workers, the public and the environment. The requirements of the Waste Management Plan are outlined in the Submittals section of this specification.

2) Close-Out Submittals

a. The Contractor shall provide copies of all documentation pertaining to the disposal of all hazardous and non-hazardous waste generated during the work, including but not limited to, a written log of the type and quantity of waste that was generated and removed from the project site, executed waste manifests/waste shipment records (if applicable), bills of lading, waste shipment records.

B. Waste Handling Requirements

1) General

b. The Contractor is responsible for all labor, materials, equipment, services, and costs associated with the proper and compliant collection, handling, separation, containerization, and storage of solid, liquid, hazardous, non-hazardous, industrial, and municipal wastes generated throughout the course of the work in accordance with all applicable Federal, State and Local laws, codes, rules and regulations. Waste handling shall be conducted in accordance with 40 CFR Part 261, Part 262, and Part 268, and applicable state and local regulations.

c. Unless otherwise directed, Metro-North Railroad shall be responsible for the lawful transportation and disposal of all hazardous and non-hazardous industrial wastes. The Contractor is responsible for the disposal of all non-hazardous, non-industrial, and municipal waste streams.

d. The Contractor is solely responsible for obtaining any and all permits, certificates, variances, etc. required for onsite waste storage.

e. The Contractor shall arrange for the transportation and disposal of all waste with Metro-North Railroad and Metro-North Railroad's representatives as specified in this specification.

f. Under no circumstances shall wastes or contaminated debris be allowed to remain in the work area upon conclusion of the work shift. At a minimum, the Contractor shall collect and store the waste at the end of each working day in USDOT-approved storage drums or containers such that no waste is left exposed overnight.

g. When cleaning paint chips and dust, the Contractor shall use vacuuming equipment equipped with HEPA filters, or other means that will effectively remove the dust and debris without re-dispersing lead laden particulate into the air.

h. The Contractor shall recover all waste products generated during the work, including but not limited to containment materials, rags, tapes, sealants, disposable personal protective equipment, filters, paint debris, paint cans, wastewater, etc.

The contractor shall provide containers for the collection, storage and disposal of all waste. Containers shall mean drums, bags or other required containers.

i. The Contractor shall train all personnel in the proper handling of hazardous waste in accordance with 40 CFR 265.16 and 6 NYCRR 373. Include procedures in the Waste Management Plan that will be followed in the event of a release or spill, including required notifications and methods to be used for cleanup. Maintain all training records on-site.

j. The use of additives to render the waste non-hazardous is prohibited.

k. All wastes generated by the Contractor during the work are the property of Metro-North Railroad. Metro-North Railroad shall be known and listed as the primary generator of regulated wastes. The Contractor shall be known as the co-generator of regulated wastes for this project. The Contractor as co-generator is legally and contractually responsible for the proper collection, handling, and storage of waste.

l. The Contractor shall not discharge any waste, potentially contaminated material, or hazardous or regulated material, solid or liquid, into the natural environment. At no time shall the Contractor discharge any liquid effluent, including wastewater, "gray water", sewage, solvent borne materials, fuels, etc. into the natural environment.

m. Wastewater containing contaminants unable to be properly handled and treated by the wastewater treatment facility shall not be discharged into the sanitary sewer system.

n. Liquid wastes not acceptable to the sanitary sewer system shall be containerized and disposed of in accordance with applicable regulations.

o. If soil remediation is required as a result of the Contractor's activities, the Contractor shall place the soil into separate containers, and assume all costs for its testing, storage and disposal.

p. Improper handling and storage of waste may result in the immediate shut down of the project until appropriate corrective action is completed.

2) Separation of Waste Streams

a. In an effort to minimize the quantity of hazardous wastes generated in compliance with EPA and RCRA requirements, the Contractor shall separate wastes into differing waste streams based upon their general type and composition. Wastes shall be separated into the following waste streams:

i. General construction debris and other non-contaminated debris (such as cardboard boxes from materials and supplies brought to the site, containers, empty cans, etc.

ii. Paint debris, paint chips, paint dust, respirator cartridges, filters from air filtration devices and HEPA vacuums

iii. Painted demolition debris

iv. Disposable personal protective equipment

v. Containment sheeting and materials

vi. Cleaning devices

vii. Liquid paint residues

viii. Solvents and/or paint thinners

ix. Painted scrap steel components

x. Painted demolition debris

xi. Filtered wastewater

xii. Any other potentially hazardous or regulated wastes generated during the work shall be segregated into separate waste streams, containerized separately in approved storage containers, and properly stored in approved locations.

3) Characterization & Classification of Wastes

a. Historically, based upon the sampling and testing of wastes generated on previous paint removal projects, lead paint wastes are characterized as hazardous based upon lead toxicity. However; the Contractor shall not assume any potentially contaminated waste, with the exception of paint debris, paint chips, paint dust, respirator cartridges, filters from air filtration devices and HEPA vacuums, is hazardous. Testing of each potentially contaminated waste stream shall be conducted by the environmental monitor to satisfy the requirements of the law, as well as that of the transporter and the disposal facility. Testing shall be conducted in accordance with 40 CFR 261, Appendix II, Method 1311 Toxicity Characteristic Leaching Procedure (TCLP).

b. Metro-North Railroad is responsible for all costs associated with laboratory analysis for the characterization of wastes.

c. The Environmental Monitor shall conduct sampling of the various waste streams and report the laboratory results to the Contractor. The Environmental Monitor is responsible for the collection of representative samples of each of the potentially contaminated waste streams and submission of such to an accredited laboratory for analysis via the EPA Toxicity Characteristic Leaching Procedure in order to confirm the classification of the waste as hazardous and non-hazardous. Upon receipt of Toxicity Characteristic Leaching Procedure data, arrangements for the disposal of wastes in accordance with the results of the testing shall be made with Metro-North Railroad or Metro-North Railroad's representative. If the nature of the waste stream initially tested remains constant additional classification is not required for subsequent shipments unless otherwise directed by Metro-North Railroad or Metro-North Railroad's representative, or required by federal, state or

local laws, codes or regulations, or the waste recycling or disposal facility. Should the nature of a waste stream change after the initial testing, additional representative samples shall be collected and analyzed to re-characterize the waste stream.

d. The Contractor is hereby notified that hazardous substances other than heavy metals may be present in the waste, characterizing it as Hazardous Waste as defined in 40 CFR 261

e. Solvents designated for disposal shall be characterized as hazardous waste because their ignitable and toxic properties. Solvents that will be used for a purpose other than disposal shall not be classified as waste, and shall be handled in accordance with the Contractor's approved solvent handling plan. The Contractor shall provide written documentation of the tracking of these solvents while on site and during transportation, including proof of receipt at the final destination.

f. Chemical paint strippers typically contain solvents and/or highly alkaline materials. Waste containing chemical paint strippers shall be characterized appropriately based upon their constituents.

4) Containerization

a. Containerization and packaging of wastes shall be conducted in accordance with 49 CFR Part 172, Part 173, and Part 178 and other applicable sections of the Department of Transportation (DOT) regulations.

b. The Contractor shall maintain an adequate supply of clear plastic bags for the containerization of lead contaminated debris. The waste bags for lead debris shall be clear, polyethylene plastic, having a six (6) mil thickness or greater. Black or opaque bags are prohibited from use, unless specified by Metro-North Railroad. Pre-printed asbestos waste bags are prohibited from use for containerization of lead debris.

c. All potentially hazardous wastes shall be deposited and sealed in appropriate containers or roll off containers concurrent with waste generation.

d. Separate waste streams shall be containerized separately.

e. The Contractor shall cover all containers immediately upon filling and confirm that all lids are attached except when filling and that all required labels are affixed and remain intact and legible. Waste containers shall be properly and securely fastened and sealed upon being filled to capacity.

f. Two (2) methods of waste containerization and transportation are acceptable to Metro-North Railroad; 1) bulk disposal via roll-off style waste containers or 2) drum disposal, utilizing 1A1 or 1A2 approved containers. The Contractor may utilize a combination of such containerization and transportation methods.

g. The Contractor shall supply waste containers meeting the requirements of the Department of Transportation 1A1/1A2 designation, or other containers approved by Metro-North Railroad for the disposal of lead contaminated debris. Waste

containers shall comply with the requirements of 40 CFR 262.30-262.32 and 49 CFR Part 172 and Subpart F. 1A1 or 1A2 approved drums shall be new or reconditioned and suitable for the containerization and disposal of hazardous lead waste. Use containers that are resistant to rust and corrosion (painted, if constructed of steel), that have tight fitting lids or covers, and which are water resistant and leak proof.

h. The Contractor shall maintain all containers in good operating condition with all lids and closing mechanisms intact and operational to prevent the escape of debris, spilling of the contents, or access by unauthorized personnel and observe all labeling requirements.

i. The Contractor shall inspect the drums or containers for corrosion, legible labels, proper covers, ground protection, and leaks on a weekly basis and record the results of all the inspections in a log book.

j. Drums for liquid wastes shall have permanently sealed lids with bung openings.

k. Drums for solid wastes shall have removable lids with the appropriate fitting bolted clasps. Spring lever clasps shall not be utilized.

l. Roll off containers shall be lined with bladders provided by the waste transporter or polyethylene sheeting having a nominal thickness of six (6) mils.

m. No container shall be filled to a capacity exceeding the maximum dry volume capacity marked on the container. No container shall be filled to a capacity that will result in a payload weight exceeding the transportation vehicle's safe operating parameters or Department of Transportation (DOT) regulations pertaining to gross vehicle weight. If overfilled containers cause delays during pick-up, remediate the situation at no additional cost to Metro-North Railroad.

n. The Contractor shall provide all containers for non-hazardous waste, including filtered wastewater. Use containers that are free of loose debris when brought on-site. Wastewater shall be containerized in USDOT approved polyethylene drums having sealed lids with bung openings.

o. The Contractor shall provide all containers for liquid paint residues and spent solvents, whether the liquid paint residue or solvent is designated for reuse, or for disposal as a hazardous waste. Liquid paint residues and solvents shall be containerized in USDOT approved steel drums having sealed lids with bung openings. Spent solvents and liquid paint residues shall not be mixed with spent abrasives, paint debris, water, or other waste.

5) Labeling & Identification

a. The Contractor shall immediately label all containers of hazardous waste in accordance with 40 CFR 262, and 49 CFR 171-179 and 6 NYCRR 372. All waste containers shall be properly labeled. Under no circumstances shall containerized debris be stored without proper labeling.

b. All materials shall be labeled and shall conform and comply with the Contractor's Hazardous Communication Program as per 29 CFR 1910.1200 and 1926.059 as well as all applicable state "Right To Know" legislation.

c. The accumulation start date on each container shall be the start date of hazardous waste accumulation. the environmental monitor shall enter it using permanent marking material.

d. A label describing the contents of each container shall be affixed to the outside of the container.

e. Unless otherwise directed, all labeling, marking, and placards shall be the responsibility of the Contractor and shall be done under the supervision of Metro-North Railroad, the Engineer, and the environmental monitor. This work shall be completed to Metro-North Railroad's, The Engineer's, and the environmental monitor's satisfaction prior to the filling or transportation of any particular container.

f. All label markings shall be permanent, printed in English, displayed on a background of contrasting color unobscured by other labels, or attachments. Labeling shall be located away from other markings that could substantially reduce its effectiveness.

g. The contracted waste transporter shall provide all required labels.

h. Upon receipt of results of characterization analyses (TCLP), labels shall be changed to reflect the characterization of the waste. If characterized as hazardous waste, complete the absent information upon receipt of the testing results. Include the following minimum information on the labels:

    i. "Hazardous Waste. Federal law prohibits improper disposal. If found, contact the nearest police, or public safety authority, or the US Environmental Protection Agency."

    ii. Proper DOT Shipping Name (e.g., RQ Hazardous Waste Solid, N.O.S. 9, NA 3077, PG III)

    iii. Manifest Document No (when manifest is prepared; prior to shipping)

    iv. Generator Name, Address, EPA ID Number, and Contract Number.

    v. Date of Accumulation (First day waste placed into container)

    vi. EPA Waste Number

i. The Contractor shall enter the above information using permanent marking material, printed in English, and displayed on a background of contrasting color unobscured by other labels or attachments. Locate labeling away from other markings that could substantially reduce its effectiveness.

j. The Contractor shall complete the labeling, marking, and placarding activities under the observation of Metro-North Railroad or their designee, prior to storing or transporting any container or roll-off.

6) Storage

a. The Contractor shall maintain a secure temporary waste storage/holding area on site as required by the work. The waste storage area shall be a securable, lockable enclosure segregated from access by unauthorized personnel. The Contractor shall determine a suitable location for temporary on site storage of wastes generated throughout the project. The Contractor shall submit the proposed waste storage location to Metro-North Railroad for approval. Waste shall be stored only in areas approved by Metro-North Railroad. The design and location of the waste storage area shall be submitted by the Contractor in the waste management plan.

b. The Contractor shall store non-hazardous waste separately from hazardous waste. Hazardous and non-hazardous waste shall not be mixed and stored together unless approved in advance in writing by Metro-North Railroad.

c. The Contractor shall locate all hazardous waste containers on protected ground (e.g., covered with impermeable tarps) and in a secure area with signs around the perimeter. The Contractor shall adequately shield and/or protect the surrounding area when transferring and/or conveying hazardous waste from one container to another to prevent any dispersion. The storage location(s) must be approved by Metro-North Railroad in advance.

d. Containers shall be elevated from ground surfaces via pallets or other approved means.

e. Arrange containers in the storage area for easy accessibility. Stage the containers together in lots no greater than two rows of five containers each. Maintain a minimum lane clearance of thirty-six (36) inches between each lot of ten containers.

7) Transportation & Disposal

a. Unless otherwise specified in the Contract Documents, transportation and disposal of wastes shall be conducted under separate contract by Metro-North Railroad.

b. Unless otherwise specified in the Contract Documents, Metro-North Railroad shall be responsible for the transportation and disposal of hazardous wastes. Transportation and disposal of hazardous wastes is excluded from the Contractor's scope of work.

c. Unless otherwise specified in the Contract Documents, under no circumstances shall the Contractor remove or transport potentially hazardous wastes from the project site without the prior approval and permission of Metro-North Railroad.

d. The Contractor shall be responsible for coordinating the transportation of hazardous wastes with Metro-North Railroad and Metro-North Railroad's

representatives responsible for arranging for the transportation of hazardous wastes.

e. When the transporter arrives to load the waste, the on-site representative may be required to sign the manifest "As Agent For Metro-North Railroad" with their signature. The "Generator" copies of waste manifests, bills of lading, etc. shall be retained and submitted to the Metro-North Railroad Department of Environmental Compliance & Services within three (3) business days.

8) Non-Hazardous Wastes & General Refuse

a. The Contractor shall properly transport, and dispose of all non-hazardous, non-industrial waste and general refuse. The Contractor shall make provisions for the removal of all non-regulated, general garbage generated as a result of his work. The Contractor shall provide their own trash dumpster(s) for the removal of all non-regulated debris and shall not use Metro-North Railroad's containers without the prior approval of Metro-North Railroad. The Contractor shall not site any roll-off containers / dumpsters on Metro-North Railroad's property without the prior approval of Metro-North Railroad.

b. The Contractor shall comply with NYC Department of Sanitation regulations as applicable.

c. The Contractor shall provide a suitable rubbish container device, properly maintained and serviced, replaced as required and protected from access by the public by fencing as approved by Metro-North Railroad.

d. The Contractor shall provide daily trash collection and cleanup of the project area and shall dispose of all discarded debris, and the like in a manner approved by Metro-North Railroad.

e. Contractor shall sweep up and gather together daily all his own rubbish and place same in containers. Wood crates and similar matter shall be broken up, securely tied into bundles and stacked alongside rubbish containers or in locations as approved by Metro-North Railroad.

f. The Contractor shall provide Metro-North Railroad with bills of lading for all non-hazardous wastes removed from the project site.

9) Special Requirements for Recycled Steel Abrasives

a. When recycled steel abrasives are used, the Contractor shall collect, handle, store, transport, and dispose of the steel abrasive/paint waste as hazardous waste, regardless of the results of the characterization analyses.

10) Special Requirements for Recycling Scrap Steel Coated With Lead Containing Paint

a. Scrap steel coated with lead containing paint shall not be classified as hazardous waste if the steel is sent to a recycling facility approved by Metro-North Railroad. If the lead based painted steel is not recycled, the material shall classified as hazardous or non-hazardous based upon TCLP analysis of the paint itself.

b. The Contractor shall make arrangements with a scrap metal dealer for the removal and recycling of scrap steel coated with lead containing paint. The Contractor may utilize a scrap dealer under contract with Metro-North Railroad, or may utilize other dealers approved by Metro-North Railroad. If the scrap steel is not recycled, the Contractor shall dispose of such in the same manner as other solid wastes containing lead.

c. The Contractor shall utilize lined roll-off containers for the on-site accumulation and storage of all demolished scrap steel coated with lead containing paint.

d. The Contractor shall provide the scrap metal dealer with a written notification that the steel to be received is coated with lead containing paint. A copy of the written notification shall be provided to Metro-North Railroad or his designee prior to shipping the steel. (See example at end of this section)

e. The Contractor shall provide Metro-North Railroad with written confirmation from the scrap dealer, at the time it is received, stating that the coated steel will be recycled and will be properly destroyed within sixty (60) days of removal from the site.

11) Wastewater Handling & Disposal

a. The Contractor shall provide containers for the collection and retention of all wastewater, including but not limited to, water used for hygiene purposes, laundering of clothing if done on site, surface preparation by means of power washing or water jetting, and cleanup activities. Filtered wastewater shall be containerized in polyethylene drums or an approved equal. Steel drums are not permitted for containerization of wastewater.

b. All wastewater generated through pressure washing, the decontamination facility or manual washing shall be filtered through a filtration system capable of removing visible paint chips, particulate, heavy metals and suspended solids prior to placing it into storage containers. Filter the water until the water is not classified as hazardous and will be permissible to dispose of as described below.

c. Prior to disposal, the environmental monitor shall collect samples of filtered, containerized wastewater for analysis to determine lead concentrations. Upon receipt of analytical data demonstrating lead concentrations less than the local discharge limit for the municipality in which the work is being conducted, wastewater may be discharged into the sanitary sewer system, if approved by the local publicly owned treatment works (POTW).

d. The Contractor shall make disposal arrangements with the local publicly owned treatment works (POTW), sanitation company, or other appropriate permitted facility and provide Metro-North Railroad with documentation signed by an official of the facility stating that the facility will accept the waste, and that the levels of any lead or other metals remaining in the water are acceptable. If the facility allows the filtered water to be placed into the sanitary sewer system, include such authorization in the letter.

12) Recordkeeping & Logging of Generated Wastes

a. The Contractor shall maintain inventory by location of waste type collected, quantity, dates stored and dates released to waste hauler. This inventory shall be maintained on site and made readily available to Metro-North Railroad. This inventory shall be kept as part of the Contractor's log book.

b. The Contractor shall cooperate with Metro-North Railroad, the Engineer, and the environmental monitor in record keeping of waste stored and released for disposal.

c. The Contractor shall retain copies of all waste logs, manifests, bills of lading, written notifications and approvals, and all other documentation pertaining to the transportation and disposal of hazardous and non-hazardous waste generated during the work. Copies of the documentation shall be provided to Metro-North Railroad as part of the project closeout submittals.

3.07 Environmental Protection

A. The Contractor shall adhere to the applicable federal, state and local laws and regulations pertaining to the protection of the environment. For the duration of the project, the Contractor shall comply with all applicable federal, state, city, and local laws, regulations, and ordinances pertaining to environmental protection, including all applicable New York State Department of Environmental Conservation (NYSDEC) and New York City Department of Environmental Protection (NYCDEP) requirements.

B. The Contractor shall be familiar with the specific requirements of environmental protection laws, regulations, and ordinances. It is the responsibility of the Contractor to ensure that its subcontractors, vendors, and suppliers comply with applicable requirements.

C. Environmental protection considerations shall include, but are not limited to, the following:

1) Protection of Existing Natural Features and Vegetation
2) Air & Water Pollution
3) Hazardous materials &toxic substances
4) Lead containing particulates such as dust and fumes
5) Dust Control
6) Noise Abatement
7) Erosion and sedimentation control
8) Light Pollution

The Contractor shall execute the work in a manner which prevents releases of environmentally degrading substances such as petroleum-based products, volatile organic compounds, and hazardous materials into the environment.

D. Environmental Remediation Resulting From Contractor’s Operations

1) Should the Contractor’s work result in the release of a lead containing material, hazardous material, or other regulated material during performance of the work, the Contractor shall take all actions necessary to remediate the condition. All remedial actions shall be conducted per the direction of Metro-North Railroad or those serving as representatives of

Metro-North Railroad, the Coast Guard, and federal and state agencies. Remedial actions shall be completed meeting the satisfaction of Metro-North Railroad, the Coast Guard, and federal and state agencies.

2) Remedial actions may include and are not limited to, complete removal and replacement of soil/ballast, facilities, equipment, furnishings, or other materials as deemed necessary by Metro-North Railroad to return the site to pre-existing or better conditions.

3) The Contractor is hereby notified that in the event the Contractor fails to remediate the condition within a schedule acceptable to Metro-North Railroad or to the degree acceptable to Metro-North Railroad, Metro-North Railroad may remediate the condition with its own or other contracted forces. Metro-North Railroad shall deduct the cost of the remediation work from any moneys due the Contractor from Metro-North Railroad per the conditions of the MTA Metro-North Railroad General conditions and Contract governing this scope of work.

(NOTE: THE CONTRACTOR GENERATING THE SCRAP SHALL COMPLETE THE FOLLOWING AND SUBMIT IT TO THE SCRAP YARD/RECYCLER. METRO-NORTH RAILROAD SHALL BE PROVIDED A COPY OF THE SIGNED ACKNOWLEDGEMENT.)

Click here to enter DATE.

Click here to enter NAME & ADDRESS OF SCRAP DEALER.

Re: Notification of Lead Containing Material

Dear Sir/Madam:

Metro-North Railroad's policy requires us to provide you written notification that the material you will receive contains Lead. The scrap material(s) you are receiving from the Metro-North Commuter Railroad Company Click here to enter CONTRACT NUMBER, PROJECT DESCRIPTION, & ADDRESS contains Lead. These materials consist of Click here to enter DESCRIPTION OF MATERIAL. Testing has determined that the materials you will be accepting have Lead containing paint on them.

Kindly acknowledge receipt of this written notification by completing the section below and returning the original to my attention.

Regards,

Insert Name

ACKNOWLEDGEMENT OF RECEIPT OF LEAD CONTAINING MATERIAL

The entity identified below acknowledges receipt of the lead containing material identified above. We will insure that appropriate precautions/procedures are followed in accordance with the requirements of all regulatory agencies having jurisdiction related to lead containing materials.

Company Name:	Click here to enter text.	Phone:	Click here to enter text.
Address:	Click here to enter text.		
Officer's Name (Print):	Click here to enter text.	Signature:	
Officer's Title:	Click here to enter text.	Date:	April 1, 2018

END OF SECTION

Metro-North Railroad

LEAD PROJECTS
SUBMITTAL OUTLINE & CHECKLIST

*The following outline and checklist is a list of mandatory submittals required for any activity which will disturb lead containing coatings or materials on Metro North Railroad property. Please refer to the MNR LEAD HEALTH PROGRAM for details on submittals requirements for **Lead** projects. This checklist shall be completed by the Contractor and submitted with all required submittals. Failure of the Contractor to complete this checklist shall be grounds for rejection of the submittal.*

Contract Number / Project Description	
Contractor	

(Check One)	☐ Initial Submittal ☐ Revised Submittal	Revision Number Revision Date	

	Description	Included	Not Applicable	Comments/Notes Identify Revised Section – Revision Number & Date
GENERAL				
☐	Cover page including name of contractor, contract number, contract title, revision number, revision date, name and signature of Safety Engineer who wrote the LHASP (Lead Health and Safety Plan)			
☐	Table of Contents providing section numbers, title or description of the section contents, the page number of each section, list of attachments, and the revision number and revision date of each section.			
CORPORATE				
☐	Corporate Health and Safety Plan			
☐	Respiratory Protection Plan			
☐	Personal Protective Equipment (PPE) Program			
☐	Hazard Communication Program			
CORPORATE – PROJECT SPECIFIC				
☐	Lead Health and Safety Plan (LHASP) Site Specific			
☐	Site Specific Compliance Plan (29 CFR 1026.62 (e))			
☐	Waste Management Plan			
☐	List and Qualifications of Subcontractors to be utilized by discipline			
☐	Containment Plan			
☐	Cleaning, Surface Preparation/Re-Coating Plan			

LEAD PROJECTS
SUBMITTAL OUTLINE & CHECKLIST

	Description	Included	Not Applicable	Comments/Notes Identify Revised Section – Revision Number & Date
☐	Applications, Notifications, Permits			
☐	Material Safety Data Sheets			
☐	Catalogue Cut Sheets, Product & Technical Data Sheets			
☐	Samples of Materials & Products			
EACH INDIVIDUAL (As part of LHASP)				
☐	Certificate of Lead Awareness Training (29 CFR 1926.62 (I) (2)			
☐	Lead Physical Examinations (29 CFR 1926.62 (j) (3))			
☐	Analytical results of blood analysis consisting of Blood Lead Level and Zinc Protoporphynrin testing performs within 15 days of start date			
☐	Respirator Fit Test			
☐	Medical Clearance to wear Respiratory Protection			
☐	SSPC, C3 Certification for Competent Person			
☐	Requirement for all on site employees to complete Metro-North Roadway Worker/Contractor Safety Orientation Training			

Prepared By:

Printed Name: _____ **Signature:** _____ **Date:** _____

Title: _____ **Telephone Number:** _____ **Email:** _____

Note: *Metro North Railroad Office of System Safety (OSS) has a minimum of (10) ten working days from receipt of the submittal, to review and response to all submittals, drawings and calculations.*

(NOTE: THE CONTRACTOR GENERATING THE SCRAP SHALL COMPLETE THE FOLLOWING AND SUBMIT IT TO THE SCRAP YARD/RECYCLER. METRO-NORTH RAILROAD SHALL BE PROVIDED A COPY OF THE SIGNED ACKNOWLEDGEMENT.)

Click here to enter DATE.

Click here to enter NAME & ADDRESS OF SCRAP DEALER.

Re: Notification of Lead Containing Material

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Kindly acknowledge receipt of this written notification by completing the section below and returning the original to my attention.

Regards,

Insert Name

ACKNOWLEDGEMENT OF RECEIPT OF LEAD CONTAINING MATERIAL

The entity identified below acknowledges receipt of the lead containing material identified above. We will insure that appropriate precautions/procedures are followed in accordance with the requirements of all regulatory agencies having jurisdiction related to lead containing materials.

Company Name:	Click here to enter text.	Phone:	Click here to enter text.
Address:	Click here to enter text.		
Officer's Name (Print):	Click here to enter text.	Signature:	
Officer's Title:	Click here to enter text.	Date:	February 4, 2014

Metro-North Railroad Environmental Compliance & Services

Approved waste management consultants, disposal facilities, transporters, and laboratories

Waste Management Consultants

WTS, Inc. 435 North 2nd Street Lewiston, NY 14092 716-754-5400 **Capabilities:** Full service waste management firm supplying sampling and analysis, waste characterization, waste profile preparation, logistics, transport and disposal, and preparations of manifests and bills of lading	**WRS, Inc.** 17 Old Dock Road Yaphank, NY 11980 631-924-8111 **Capabilities:** Full service waste management firm supplying sampling and analysis, waste characterization, waste profile preparation, logistics, transport and disposal, and preparations of manifests and bills of lading	

Disposal Facilities

110 Sand and Gravel 170 Cabot Street W. Babylon, NY 11980 631-694-2822 **Capabilities:** Railroad ties, non-hazardous soil	**Advanced Greentree Landfill** 635 Toby Road Kearsey, PA 15846 814-231-1744 **Capabilities:** Landfill for non-regulated material	**AERC** 2591 Mitchell Avenue Allentown, PA 18103 610-797-7608 **Capabilities:** Universal waste and mercury recycling
Bayshore Recycling Corp. 75 Crow Mills Road PO Box 290 Keasbey, NJ 08832 732-738-6000 **Capabilities:** Non-hazardous petroleum contaminated soils	**Clean Earth of Carteret, Inc.** 24 Middlesex Road Carteret, NJ 07008 215-428-1700 **Capabilities:** Non-hazardous petroleum contaminated soil	**Clean Earth of New Castle** 94 Pyles Lane New Castle, DE 19720 302-427-6633 **Capabilities:** Non-hazardous petroleum contaminated soil

Clean Earth of North Jersey 115 Jacobus Avenue S. Kearney, NJ 07032 973-344-4004 **Capabilities:** Non-hazardous petroleum contaminated soil	**Clean Earth of Philadelphia** 3201 South 61st Street Philadelphia, PA 19153 215-734-1400 **Capabilities:** Non-hazardous petroleum contaminated soil	**Clean Harbors** 761 Middle Street Bristol, CT 06010 860-583-8917 **Capabilities:** Hazardous and non-hazardous waste disposal.
Clean Harbors of Braintree Inc. 1 Hill Avenue Braintree, MA 02184 781-380-7100 **Capabilities:** Hazardous and non-hazardous waste disposal.	**Clean Harbors of Deer Park TX** 2027 Independence Pkwy South LaPorte, TX 77571 207-450-9695 **Capabilities:** Hazardous and non-hazardous waste disposal.	**Clean Harbors of El Dorado LLC** 309 American Circle Union El Dorado, AR 71730 207-450-9695 **Capabilities:** Hazardous Incineration
Clean Harbors - Spring Grove 4879 Spring Grove Avenue Cincinnati OH 45232 513-681-5738 **Capabilities:** Hazardous and non-hazardous waste disposal.	**Clean Harbors PPM LLC** 1672 E. Highland Road Twinsburg, OH 44087 330-425-3825 **Capabilities:** Hazardous and non-hazardous waste disposal.	**CWM Chemical Services** 1150 Balmer Road Model City NY 14107 716-754-8231 **Capabilities:** Hazardous and non-hazardous waste disposal. PCB landfill (soil)
Clean Water of New York 3249 Richmond Terrace P.O. Box 030312 Staten Island, NY 10303 718-981-4600 **Capabilities:** Non-hazardous waste disposal.	**Deep Green** 1106 River Road New Windsor, NY 12553 845-562-9566 **Capabilities:** Non-hazardous petroleum contaminated soil	**E-Solutions USA** 200 Engineers Road Hauppauge, NY 11788 631-234-7362 **Capabilities:** Electronic Waste
East Coast Railroad Services 42 Argenio Drive New Windsor, NY 12553 845-565-7210 **Capabilities:** Recycling of wood and concrete railroad ties	**East Penn Manufacturing Co., Inc.** Deka Road Lyon Station, PA 19536 610-682-6361 **Capabilities:** Recycling of lead acid batteries	**EQ Detroit** 1923 Fredrick Street Detroit, MI 48211 800-592-5489 **Capabilities:** hazardous and non-hazardous waste treatment/disposal

EQ Michigan 49350 I-94 Service Drive Bellville, MI 48111 800-592-5489 **Capabilities:** Hazardous and non-hazardous waste disposal, PCB landfill	**EQ Pennsylvania** 730 Vogelsong Road York, PA 17404 800-592-5489 **Capabilities:** Hazardous and non-hazardous waste disposal	**EQ Transfer & Processing** 2000 Ferry Street Detroit, MI 48211 800-592-5489 **Capabilities:** Hazardous and non-hazardous waste disposal
High Acres Landfill 425 Perinton Parkway Fairport, NY 14450 800-333-6590 **Capabilities:**	**INMETCO** 245 Portersville Road Ellwood City, PA 16117 412-758-551 **Capabilities:** Recycling of nickel-cadmium and nickel metal hydride batteries	**Minerva Enterprises Landfill** 8955 Minerva Road S.E. Waynesburg, OH 44688 330-866-3435 **Capabilities:** C&D, Asbestos Debris & PCB bulk product material
Modern Disposal Services, Inc. 4746 Model City Road Model City, NY 14107 716-754-8226 **Capabilities:** Non-hazardous landfill	**Salem County Landfill** 52 McKillop Road Alloway NJ 08001 **Capabilities:** non-hazardous landfill	**Stericycle - Providence** 275 Allens Avenue Providence, RI 02905 401-781-6340 **Capabilities:** Hazardous and non-hazardous waste disposal, medical waste management
Stericycle - Hatfield 2869 Sandstone Drive Hatfield, PA 19440 215-822-8995 **Capabilities:** Hazardous and non-hazardous waste disposal, medical waste management	**Tradebe Northeast LLC** 136 Gracey Avenue Meriden, CT 06451 203-238-6754 **Capabilities:** Oil/water and wastewater treatment (hazardous and non-hazardous)	**Tradebe Norlite Corporation** 628 South Saratoga Street Cohoes, NY 12047 518-235-0401 **Capabilities:** Oil/water and wastewater treatment
Tradebe Treatment & Recycling 50 Cross Street Bridgeport, CT 06610 203-334-1666 **Capabilities:** Oil/water and wastewater treatment	**TCI of Alabama** 101 Parkway East Pell City, AL 31525 518-828-9979 **Capabilities:** PCB transformer and oil management	**TCI of NY, LLC** 39 Falls Industrial Park Road Hudson, NY 12534 518-828-9979 **Capabilities:** Transformer disposal

Interstate Batteries **10 John Walsh Boulevard** Peekskill, NY 10566 914-737-6681 **Capabilities:** Recycle Lead Acid Batteries	

Transporters and Service Providers

Miller Environmental Group 169 Stone Castle Road Rock Tavern, NY 12575 1-800-394-8606 *Multiple Locations* **Capabilities:** Hazardous and non-hazardous rolloff, vacuum truck and drum transportation as well as site services and load assistance	**Moran Environmental Group** 20 Commerce Road Newtown, CT 06740 203-270-0095 **Capabilities:** Hazardous and non-hazardous rolloff, vacuum truck and drum transportation as well as site services and load assistance	
Citiwaste LLC 100-02 Farragut Road Brooklyn, NY 11236 718-372-3887 **Medical waste management and transportation**	**Freehold Cartage, Inc.** 825 Highway 33 Freehold, NJ 07728 732-462-1001	**HAZMAT Environmental Group** 60 Commerce Drive Buffalo, NY 14218 716-827-7217
J&D Trucking 3526 NW Blvd. Vineland, NJ 08360 856-362-3959	**Page, E.T.C., Inc.** 2758 Trombley Road Weedsport, NY 13166 800-233-2126	**PARS Environmental, Inc.** 500 Horizon Drive, Suite 540 Robbinsville, NJ 08691 800-959-1119

East Coast Railroad Services 42 Argenio Drive New Windsor, NY 12553 845-565-7210	**Tradebe Transportation** 136 Gracey Avenue Meriden, CT 06451 203-238-6754	**WRS, Inc.** 17 Old Dock Road Yaphank, NY 11980 631-924-8111
Cuenca Coronel Trucking, Inc. 74 Academy Street Belleville, NJ 07109 973-842-8937 *MBE and DBE paperwork on file*	**Trimvirate Environmental Inc.** 200 Inner Belt Road , Somerville, MA 02143 617-628-8098	**Asbestos Transportation, Inc.** 2 Moriches Middle Island Road Shirley, NY 11967 631-924-5050

Laboratories

York Analytical Labs 120 Research Drive Stratford, CT 06615 203-325-1371	**American Analytical Laboratories** 56 Toldeo Street Farmingdale, NY 11735 631-454-6100	**EET Essential Environmental Technologies** 208 Route 109, Suite 101 Farmingdale, NY 11735 631-249-1456

SECTION 02 82 13 – ASBESTOS ABATEMENT

1.0 Overview

The following document is an all-encompassing specification, intended for use with a site-specific scope of work for any and all activities which will disturb asbestos containing materials on MTA Metro-North Railroad property. The requirements of the following specification shall apply to any and all abatement, renovation, construction or maintenance activities that may disturb asbestos containing materials. While not specifically covered under this specification, potential for personal or environmental exposure to other harmful substances, including heavy metals shall be considered when determining the best methods and procedures for executing the work.

All work resulting in disturbance of asbestos containing materials shall be conducted in accordance with all applicable laws and shall employ currently accepted abatement technologies and standards of practice concurrent with applicable regulations. The Contractor shall conduct all work so as to protect the health and safety of contract employees, MTA Metro-North Railroad employees, the surrounding community, the public, and the environment.

2.0 Project Requirements

2.1 General

A. "Owner" as referenced throughout the remainder of this specification shall be known as, MNRR, or MTA Metro-North Railroad, or a designated entity or third party representing MTA Metro-North Railroad.

B. "Contractor" as referenced throughout the remainder of this specification shall be known as any entity that has entered into contract with MTA Metro-North Railroad or sub-contract with a Prime Contractor for the purpose of asbestos abatement.

C. "Engineer" as referenced throughout the remainder of this specification shall be known as, the Resident Engineer, Project Engineer, Site Engineer, or Construction Manager, representing the best interest of MTA Metro-North Railroad, assigned to direct, manage, and oversee the execution of the work.

D. "Environmental Monitor" as referenced throughout the remainder of this specification shall be known as the designated entity or third party, representing the best interest of MTA Metro-North Railroad, responsible for overseeing compliance with asbestos removal and/or environmental protection regulations and requirements. The Environmental Monitor shall be contracted separately from and have no common ownership with the Contractor.

E. The Contractor shall provide all labor, materials, equipment, services, certificates, variances, permits, and insurances necessary to execute the site-specific scope of work. The Contractor shall complete the work as per the requirements set forth herein and at the direction of the Owner, the Engineer, and the Environmental Monitor.

F. The Contractor shall perform the work in accordance with the submittals required under this specification, submitted to and approved by the Owner, the Engineer, and the Environmental Monitor. The Contractor will not start any work, on-site, until all submittals required under this specification have been reviewed and approved by the Owner, the Engineer, and the Environmental Monitor. The Contractor will not be permitted to proceed with the work if the materials, equipment or products delivered to the jobsite differ from those submitted and approved for use. The Contractor shall conduct the work utilizing the methods, procedures, equipment, materials, products submitted by the Contractor and approved for use.

G. Asbestos abatement shall be conducted in accordance with these specifications, MTA Metro-North Special Conditions, and all other applicable standards, local, state and federal regulations.

H. The Contractor shall comply with the requirements of this specification and all applicable Federal and State laws, codes, and regulations, including but not limited to the regulations of the United States Environmental Protection Agency (USEPA), United States Department of Transportation (USDOT) Occupational Safety and Health Administration (OSHA), New York State Department of Environmental Conservation (NYS DEC), New York State Department of Health (NYS DOH), and the New York State Department of Labor (NYS DOL). The referenced regulations, standards, codes shall be of the latest revision in effect at the time of execution of the work. Recommendations or suggestions in referenced regulations, codes, and standards promoting employee health and safety or the overall quality of the work shall be deemed mandatory.

I. Reference to specific regulations, standards, codes, or other items in this specification which are of specific interest to the Owner in no way relieves the Contractor of the requirement to comply with all applicable legal requirements, nor should it be construed that the Owner, the USEPA, USDOT, NYSDEC, NYSDOH, NYSDOL or other Federal, State and City regulators are only interested in these items. Compliance with this specification does not relieve the Contractor of the obligation to comply with other applicable requirements.

J. Reference of a particular code, regulation or standard shall apply to the work with the same authority as if it were included verbatim in the specifications. Work shall conform to the applicable provisions of reference documents cited directly in the specifications and shall also conform to all codes, standards and specifications, or part thereof, cited in reference documents stipulated in the specifications.

K. If an applicable law, code or regulation is more restrictive than the requirements of this specification; the Contractor shall follow the more restrictive requirements. In event of conflict between codes, regulations, standards, contract documents, specifications, the more restrictive requirements shall apply as interpreted by the Owner. In the event of conflict, the Contractor shall inform the Owner, in writing, of the conflict. The Owner's decision regarding applicability of the provisions applied independently or as supplemented, modified or voided, shall be final.

L. For estimating and bidding purposes, the Contractor shall assume the most restrictive method will prevail and shall prepare the proposal to reflect the most applicable, restrictive method.

M. It is the responsibility of the Contractor to ensure that all subcontractors, vendors and the like are familiarized with the requirements of this specification. Each entity engaged in the work is required to be familiar with the standards applicable to that entity's activity.

2.2 MTA Metro-North Railroad Specific Requirements

a. The Contractor is hereby notified that MTA Metro-North Railroad is an active railroad and that construction activities on MTA Metro-North Railroad property are governed by special safety procedures. It is the responsibility of the Contractor to become familiar with MTA Metro-North Railroad's Safety and Operating Procedures. The Contractor shall be responsible for the protection of employees, MTA Metro-North Railroad property, commuters, customers, and the general public during performance of the work.

b. The Contractor is hereby notified that all employees and sub-contractors involved in the work are required to complete the MTA Metro-North Railroad Contractor Safety Orientation Training Program prior conducting any work on MTA Metro-North Railroad property. MTA Metro-North Railroad will provide the training at no cost to the Contractor at a time and place mutually agreed upon by both parties. It is the responsibility of the Contractor to coordinate such training with MTA Metro-North Railroad prior to the start of work. The Contractor is hereby notified that he/she will be prohibited from commencing work on, or accessing MTA Metro-North Railroad property, until such training is completed. It is the responsibility of the Contractor to coordinate additional training as necessary should the work force change while the work is underway including addition of new employees or a subcontractor not having previously received training. The training is valid for a period of one (1) calendar year. MTA Metro-North Railroad will provide annual refresher training at no cost to the Contractor at a time and place mutually agreed upon by both parties.

2.3 Owner's Representatives

A. The Contractor shall adhere to the requirements of this specification, any regulatory agency inspecting the work, managing agents, project managers, project engineers, or any other entities or individuals representing the best interest or overseeing the work for the Owner.

B. The Owner may engage the services of third parties to oversee work conducted by the Contractor. The Project Engineer and Environmental Monitor shall serve as representatives of the Owner, serving the best interest of the Owner. The Engineer and the Environmental Monitor shall report to the Owner on matters pertaining to the work being performed and the Contractor's conformance with these specifications and regulatory requirements. The Project Engineer and the Environmental Monitor shall report only to The Owner. The Owner authorizes the Project Engineer and the Environmental Monitor to have free access to the work site and all work areas for the performance of his/her duties.

C. The Contractor is hereby notified that the Engineer or the Environmental Monitor has the authority to stop the Contractor's work if he/she witnesses or observes an instance of substantial non-conformance with these specifications, the contract documents, and/or a situation that may adversely affect the health, safety, and/or well being of the Contractor's workforce, the Owner employees, the MNRR customers, general public, and/or the environment.

2.3 Owner's Representatives *(continued)*

Work may be stopped for instances including but not limited to, non-conformance with contract documents or specifications, unsafe work practices, employee misuse or non-use of appropriate personal protective equipment, releases or emissions resulting from the work, usage of materials or equipment other than those submitted and approved for use, work not meeting the satisfaction or standard of quality of the Owner or the Engineer. The Contractor shall not resume work until corrective measures have been implemented meeting the satisfaction of the Owner, the Engineer, and the Environmental Monitor.

2.4 Use of Subcontractors

A. Subcontractors, vendors, or parties representing the Contractor shall be required to familiarize themselves with the requirements of this specification.

B. The Contractor shall submit an executed Statement of Qualification for each proposed Subcontractor to the Owner for review and approval prior to using any subcontractor(s) to perform any of the specified work.

C. The Contractor's use of subcontractor(s) shall not relieve the Contractor of full responsibility for the work to be performed by the Subcontractor. Nothing provided herein shall create any relationship in contract or otherwise between the Contractor's subcontractor(s) and the Owner. Furthermore; nothing herein shall create any rights to any third party or any obligation on the part of the Owner to any third party.

Project Notifications

A. The Contractor shall provide formal written notification to all local, state and/or federal agencies as required by law or as directed by the Engineer. The contents of the agency notification(s) shall

be submitted to the Owner for review fifteen (15) days prior to the deadline for submittal to a specified agency.

The Contractor shall notify the following agencies of the asbestos removal project ten days in advance of the start:
EPA – Environmental Protection Agency
Asbestos NESHAPS Contract, Region 2
Air and Waste Management Division
26 Federal Street
New York, New York 10007

New York State Department of Labor
Division of Safety and Health
Asbestos Control Bureau
State Office Campus
Building 12, Room 454
Albany, New York 12240

The Contractor shall review any application for variance to relieve the Contractor from any part of applicable regulations with the Owner prior to seeking relief from the governing agency.

2.5 Occupant Notification and Posting

A. The Contractor shall ensure that notice is provided to occupants. The written notifications are to be submitted to the Owner in advance of posting for approval as to content.
   1. The Contractor shall post or otherwise provide for a written notice to occupants of the building/structure, including visitors to the building/structure, ten (10) calendar days prior to the commencement of Phase II A work on any asbestos project within the building/structure.
   2. The written notice shall be given to those occupants of a building/structure, or portion thereof, who are located on the floor or floors where the actual project is to be conducted, and one floor above and one floor below the floor or floors containing the project. In addition, such written notice shall also be given to those occupants of adjacent building/structures who have direct horizontal access to these floors.
   3. Posted notice shall be provided at all direct means of access to the floor, such as but not limited to stairways, ramps, emergency ingress or egress, elevators, escalators, ladders, hallways, corridors and trapdoors.
   4. For Small and Minor Size Asbestos Projects Only; if the Phase II A abatement work is scheduled to begin less than ten (10) calendar days after the execution of the contract, the Contractor shall post or otherwise provide written notice of any asbestos project to occupants in the building/structure.

B. The Contractor shall post all permits, filings and licenses at the work site as required by regulation. The Contractor shall maintain copies of all applicable laws and make them readily available at the work site. A copy of a valid asbestos handling license for all firms, corporations, or other business entities performing work on the asbestos project shall be conspicuously displayed proximate to but outside the regulated abatement work area, during Phase IB and Phase IIA through IID of an asbestos project.

C. Posting content and detail shall be in conformance with NYCRR 56-3.6 Posted notices shall remain in place until completion of the project.

2.6 Permits / Licenses

A. The Contractor shall obtain, at no cost to MTA Metro-North Railroad, any and all permits necessary to perform the work in full accordance with the law.

B. The Contractor shall obtain, at no cost to MTA Metro-North Railroad, any and all licenses, individual or corporate, necessary to perform the work in full accordance with the law.

3.0 References

3.01 General

A. The Contractor shall comply with all applicable laws, codes and regulations as if they are directly written herein. Failure to reference a particular code, standard, or regulation within this specification, does not relieve The Contractor from compliance with or conducting work in accordance with applicable code, standard, or regulation.

B. Work shall conform to the applicable provisions of reference documents cited directly in the specifications and shall also conform to all codes, standards and specifications, or part thereof, cited in reference documents stipulated in the specifications. Unless otherwise noted, the latest editions and revisions of the referenced codes standards, specifications and other reference documents in effect during execution of the work shall govern.

3.02 Regulations & Standards

A. The Contractor shall comply with applicable regulations and standards set forth including but not limited to the following institutions and authorities:

B. Administrative Code of the City of New York, Codes, Rules and Regulations of the State of New York (NYCRR), Code of Federal Regulations (CFR), Occupational Safety and Health Regulations General and Construction Industry, American Society for Testing and Materials (ASTM), National Institute for Occupational Health and Safety (NIOSH), American Industrial Hygiene Association (AIHA), American National Standards Institute (ANSI) Publications

C. The following diagram shall serve to define the asbestos projects phases of work as described in NYCRR Part 56, Table 1.

<table>
<tr><td colspan="2"><u>Phase 1</u>
Prior to Asbestos Abatement/ Contractor Mobilization</td><td colspan="4"><u>Phase II</u>
←
Start……..Abatement……..……End→</td></tr>
<tr><td>A</td><td>B</td><td>A</td><td>B</td><td>C</td><td>D</td></tr>
<tr><td>Asbestos Survey, Planning & Design</td><td>Background Air Sampling</td><td>Regulated Abatement Work Area(s) preparation & Enclosure Construction</td><td>Asbestos Handling Including Gross Removal or Abatement Initial Cleanings & Waste Removal</td><td>Final Cleaning & Clearance Air Samples</td><td>Final Waste Removal From Site</td></tr>
<tr><td colspan="6">← Start……..Asbestos Project……..……End→</td></tr>
</table>

4.0 Materials, Tools, & Equipment

4.01 General Requirements

A. The Contractor shall supply all materials, tools and equipment necessary to perform the work as specified. Materials, tools, and equipment shall be of a quality that will allow for completion of the work in a safe and expeditious manner and allow for completion of the work meeting the quality desired by The Owner.

B. Non-ACM preparatory and waste transfer materials (i.e. plastic sheeting, duct tape, clean waste containers, etc.) shall be stored to prevent damage or contamination. Replacement materials shall be stored outside all project regulated abatement work areas, staging areas and waste transfer/storage areas until Phase II C is completed. Equipment, materials and products shall be stored in areas approved by The Owner.

C. The Contractor shall ensure all equipment utilized during the performance of the work is mobilized clean and free of asbestos fiber, is functioning properly and is adequately maintained. In the event of equipment failure that may compromise the health and safety of workers, the public, or the environment, work shall cease until equipment is repaired and fully operational.

D. The Contractor is hereby notified that the Environmental Consultant and/or Engineer may stop work activities in the event of improper functioning or inadequate maintenance of equipment or tools critical to the health and safety of the work force and/or protection of the environment. The Owner reserves the right to stop work at any time he/she has deemed the work unsafe, has the possibility of becoming unsafe, may negatively impact the health and safety of the work force, the public, the surrounding community, or result in environmental degradation.

E. Tapes, glues, caulking materials, and other sealants shall be of high quality, perform under both wet and dry conditions, and suitable for the anticipated use. Non-ACM products shall be used to seal openings and penetrations during regulated abatement work area preparation and installation of critical barriers. Fire-Retardant Expandable Foam products with a flashpoint above 140 degrees Fahrenheit, shall be used to seal openings and penetrations during regulated abatement work area preparation and installation of critical barriers. Watertight lockable containers shall be provided to receive and retain any asbestos containing or contaminated material for storage until disposal. The containers shall be marked with danger labels.

F. Ladders, scaffolding, mobile lifts, and other access equipment shall meet all applicable OSHA requirements. Where ladders or scaffolds are used on a project to allow all work surfaces to be easily and safely reached for removal and cleaning, care shall be taken to prevent breaching of the containment areas. Scaffold joints and ladder openings shall be sealed with duct tape to prevent incursion of asbestos. During Phase II of the asbestos project, the asbestos abatement contractor shall make available, to authorized visitors, ladders or scaffolds of sufficient dimension and quantity so that all work surfaces can be easily and safely reached.

G. Power tools shall be U.L. rated and approved and attached to a GFCI protected power source. Power tools used to drill, cut, or otherwise disturb asbestos material in regulated abatement work areas, shall be manufacturer equipped with HEPA-filtered local exhaust ventilation.

H. HEPA vacuums and air filtration devices shall meet the requirements of ANSI z9.2. Filter replacement and other maintenance and repair activities that may result in the release of airborne

particulate shall be conducted under containment. Used filters shall be characterized as asbestos waste.

I. Equipment and materials used for environmental protection shall meet all requirements of the specifications and be maintained so as to provide the level of performance and service as intended or desired by the Owner and the Environmental Monitor. Materials for enclosure projects shall be impact resistant and installed to be airtight.

J. Plastic bags used for waste storage or disposal shall be at least six (6) mil in thickness and be marked with danger labels. Fire-retardant plastic sheeting of at least six (6) mil thickness in sizes and shapes to minimize the number of joints shall be used.

K. Repair materials shall be compatible with existing materials and substrates. Insulation and other repair materials shall also comply with all applicable building, energy and fire codes and shall be installed in accordance with applicable codes and manufacturer's recommendations. Replacement insulation shall meet Owner specification for type and thickness and shall have equal or greater to the insulation properties of the insulation removed.

L. All products shall be stored in their original containers with proper labeling affixed as to the contents. All materials shall be labeled and shall conform and comply with the Contractor's Hazardous Communication Program as per 29 CFR 1910.1200 and 1926.59 as well as all applicable "Right To Know" legislation.

M. Materials shall be delivered to the site in the original containers, packages, or bundles bearing the name of the manufacturer, the brand name, and the product description. Unlabeled or unidentifiable materials or products delivered to the site shall be rejected from use and shall be removed for the work site within one (1) workday of delivery. A Material Safety Data Sheet (MSDS) must be available on site for each product being used or stored on site.

N. Damaged or deteriorated materials shall not be used and shall be removed from the site within one (1) workday of discovery of damage or deterioration.

4.02 Storage of Materials, Tools & Equipment & Storage Facilities

A. The Contractor shall supply temporary lockable storage facilities for equipment, tools and materials to be used for the project. The Contractor assumes full responsibility for the security and for maintaining the good condition of all items belonging to the Contractor.

B. All materials and equipment required to perform the work shall be stored on the Owner's property in secure areas and in conformance with 56-7.2 of NYCRR Part 56. The location of the equipment/material storage area shall be selected by the Contractor and approved by the Owner.

C. Equipment, tools, and materials, with the exception of those in active use, shall be stored outside of the work area. Storage of equipment, tools, and materials shall not impede access to the work area or emergency exits.

D. All stored materials and waste drums, shall be elevated from ground surfaces via blocks, platforms, pallets, or an approved equal.

E. Materials delivered to the site shall be safely stored within the storage area and adequately protected against loss or damage. Particular care shall be exercised to protect and cover materials that are likely to be damaged by the elements. Products shall be protected against conditions exceeding the manufacturer's recommended storage conditions.

F. The Contractor shall select suitable methods and locations for hazardous material storage, if applicable. The Contractor shall submit all such information to the Owner for approval prior to use. All materials must be stored in accordance with applicable codes and regulations.

G. The Contractor is prohibited from storing any explosives and combustible, flammable or volatilizing products without the prior approval of the Owner. The Contractor shall provide separate storage for approved materials in a manner consistent with the Owner's requirements. Products shall be stored in approved containers, properly labeled and secured as directed by the Owner. At a minimum, combustible, flammable, or volatilizing waste materials shall be properly collected, packaged, labeled and stored for disposal on a daily basis.

H. The Contractor shall indicate to the Owner the most appropriate storage location for hazardous materials and request approval from the MTA Metro-North Railroad Safety Department to utilize the area.

I. The Contractor is responsible to ensure materials are stored in appropriate locations to prevent damage to the unused product. Products deemed damaged due to environmental factors, including water infiltration, freezing or excessive temperatures shall be removed from the site and replaced at the Contractor's expense. Products shall be elevated from floor surfaces to prevent formation of condensation and away from potentially damaging water sources. Temperature sensitive products shall be protected from temperature extremes.

J. The Contractor shall not deliver or store any additional materials or equipment not to be utilized during performance of the work at the project site.

5.0 Abatement Site Work

General. The Owner reserves the right to require isolation and/or segregation techniques in excess of those required by local, state and federal authorities. This shall include but not be limited to abatement sites adjacent to public access areas and routes of access to remote decontamination chambers.

5.01 Signs

A. Asbestos warning signs, required as per federal and state regulations shall be posted to restrict access to the regulated abatement work area at all locations and approaches to a location where airborne concentrations of asbestos may exceed ambient background levels.

B. During Phase II A - D activities, signs shall be posted at locations such that persons may take the necessary protective measures to avoid potential exposure. The signs shall read as follows:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNED ONLY
RESPIRATORS AND PROTECTIVE
CLOTHING
ARE REQUIRED IN THIS AREA

C. The Contractor shall establish the perimeter boundaries of the work zone. The work zone shall include the entire area utilized by the Contractor to perform the work. If site conditions allow and/or warrant, an additional buffer zone extending twenty-five (25) feet from the perimeter of the work zone shall be established. The Contractor shall maintain the signage as necessary to maintain effectiveness throughout the work.

D. The work zone(s) shall be segregated from access and made off limits to unauthorized personnel and the general public for the duration of the project. Unauthorized personnel shall be prohibited from entering the demarcated work zone. The work area shall be vacated of all unauthorized personnel prior to the start of work and shall remain off limits until and shall remain vacated until satisfactory clearance air sampling results have been achieved, the asbestos project is complete and the Owner has cleared the area for re-use. Unauthorized personnel include: persons not directly involved with the project, persons that have not been granted medical approval to wear a respirator and/ or persons without a current respirator fit test.

E. Access to the work area shall be restricted to the Owner, Contractor, and their personnel, and other authorized personnel who have received the appropriate training in respiratory protection and exposure hazards, and other personal protective equipment and decontamination procedures specified herein.

F. The Contractor is responsible for contacting the Owner to request approval for any and all persons wishing to enter the work zone that are not directly involved in the project. Only upon the Owner's approval shall such persons be allowed to enter the work zone. The Contractor shall maintain a sufficient supply of personal protective equipment at the work site for use by authorized visitors.

5.02 Decontamination Chambers

A. General

Personal decontamination chambers shall be erected in compliance with Title12 NYCRR Part 56-7.5 prior to the start of work; large or small asbestos projects. Personal decontamination system enclosures shall be constructed and functional prior to commencing the remainder of the Phase IIA regulated abatement work area preparation activities. Waste decontamination system enclosures shall be constructed and functional at the completion of Phase IIA preparation activities. After installation of the personal decontamination system enclosure, all access to the regulated abatement work area shall be via the installed personal decontamination system enclosure. Decontamination facilities shall be equipped with adequate, temporary lighting.

5.02 Decontamination Chambers *(continued)*

B. Personal Decontamination

Large Asbestos Projects

1. *Enclosure- General*. Personal decontamination enclosure systems shall be provided outside and attached to all locations where persons will enter or exit the work area. One system at a single location for each contained work area shall be required. Such systems may consist of existing rooms outside of the work area, if the layout is appropriate, that can be enclosed in plastic sheeting and are accessible from the work area. When this situation does not exist, enclosure systems may be constructed out of metal, wood or plastic support. A minimum of one (1) layer of six (6) mil fire-retardant plastic sheeting shall be installed on the ceiling, and walls of the enclosure system. At least two (2) layers of six (6) mil fire-retardant reinforced plastic sheeting shall be used for flooring protection of this area. This system must be kept clean, sanitary and climate controlled at all times in conformance with all federal, state and local government requirements. This system shall remain on-site, operational and be used until completion of Phase II C of the asbestos project.

2. *Rooms and Configuration*. The personal decontamination system enclosure shall consist of a clean room, a shower room and an equipment room connected in series but separated from each other by airlocks. There shall be a curtained doorway separation between the equipment room and the regulated abatement work area, and there shall be a lockable door to the outside. Minimum dimensions for each airlock, shower room and equipment room shall be three (3) feet wide by six (6) feet in height, to allow for adequate access to and from the regulated abatement work area.

3. *Curtained Doorways* shall consist of at least three (3) overlapping sheets of six (6) mil fire retardant plastic over an existing or temporarily framed doorway. One sheet shall be secured at the top and
left side, the second sheet at the top and right side, and the third sheet at the top and left side. All sheets shall have weights attached to the bottom to insure that the sheets hang straight and maintain a seal over the doorway when not in use.

4. *Framing.* Enclosures systems accessible to the public shall be fully framed, hard-wall sheathed and utilize a lockable door for safety and security.

5. *Sheathing* shall mean a plywood or oriented stand board (OSB) sheathing material of at least 3/8-inch thickness.

6. *Plastic Sheeting*. Enclosure systems constructed at the work site shall use at least one (1) layer of six (6) mil fire-retardant plastic sheeting on walls and ceiling. At least two (2) layers of six (6) mil fire-retardant reinforced plastic sheeting shall be used for floor protection of the enclosure system area.

7. *Prefabricated or Trailer Units*. A completely watertight fiberglass or marine painted prefabricated unit does not require plasticizing. Rooms shall be configured as per paragraph 5.02 of this Specification. All prefabricated or trailer decontamination units shall be kept in good condition, and shall be completely decontaminated after final cleaning and immediately prior to clearance air sampling. Upon receiving satisfactory clearance air results, the prefabricated units shall be sealed then separated from the regulated abatement work area and removed from the site.

8. *Clean Room* The clean room shall be sized to accommodate a full workshift of asbestos abatement contractor personnel, as well as the air sampling technician and the project monitor. The clean room shall be a minimum of six (6) feet in height. A minimum of thirty-two (32) square feet of floor space shall be provided for every six (6) full shift abatement workers, calculated on the basis of the largest work shift. If the largest work shift consists of three (3) or less full shift abatement workers, the minimum clean room size requirement is reduced to twenty-four (24) square feet of floor space. Benches, lockers and hooks shall be provided for street clothes. Shelves for storing respirators shall be provided. Clean clothing, replacement filters for respirators, towels and other necessary items shall be provided. The clean room shall not be used for storage of tools, equipment or materials. It shall not be used for office space. A lockable door shall be provided to permit access to the clean room from outside the regulated abatement work area or enclosure and shall be used to secure the regulated abatement work area and decontamination enclosure during non-work hours.

9. *Shower Room*. The shower room shall contain one (1) shower per every six (6) full shift abatement workers, calculated on the basis of the largest work shift. Multiple showers shall be simultaneously accessible (installed in parallel) to certified personnel. Each showerhead shall be supplied with hot and cold water adjustable at the tap. The shower enclosure shall be constructed to ensure against leakage of any kind. Uncontaminated soap, shampoo and towels shall be available at all times. Shower water shall be drained, collected and filtered through a system with at least 5.0-micron particle size collection capability. Submersible pumps shall be installed, maintained and utilized in accordance with pertinent OSHA regulations and manufacturer's recommendations. A multi-stage filtering system containing a series of several filters with progressively smaller pore sizes shall be used to avoid rapid clogging of the filtering system by larger particles. Filtered wastewater shall be discharged in accordance with applicable codes. Contaminated filters shall be disposed of as asbestos contaminated waste.

10. *Equipment Room*. The equipment room shall be used for the storage of decontaminated equipment and tools. A one (1) day supply of replacement filters for HEPA-vacuums and negative pressure ventilation equipment in sealed containers, extra tools, containers of surfactant and other materials and equipment that may be required during the abatement project may also be stored here. A container lined with a labeled, at least six (6) mil plastic bag for collection of clothing shall be located in this room. Contaminated footwear and work clothes shall be stored in this area.

11. *Airlocks.* Airlock construction shall consist of two (2) curtained doorways with three (3) alternating six (6) mil fire retardant polyethylene curtains per doorway, separated by a distance of at least three (3) feet, such that one passes through one doorway into the airlock, allowing the doorway sheeting to overlap and close off the opening before proceeding through the next doorway. Minimum airlock size shall be three (3) feet wide, by three (3) feet long, by six (6) feet in height.

C. Small Asbestos Projects - Personal Decontamination System Enclosure

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1. Enclosure Requirements. A personal decontamination system enclosure for a Small asbestos project shall consist of, at a minimum, an equipment room, a shower room and a clean room separated from each other and from the regulated abatement work area and other areas by curtained doorways as defined in Section 56-2.1. All other provisions for personal decontamination system for a Large asbestos project shall apply. Equipment storage, personal gross decontamination and removal of clothing shall occur in the equipment room just prior to entering the shower. The full personal decontamination system enclosure specified for Large asbestos projects is recommended.

c. Remote Personal Decontamination System Enclosure.

1. If a personal decontamination system cannot be attached to the regulated abatement work area, due to available space restrictions or other building and fire code restrictions, a remote personal decontamination system enclosure may be used for limited Special Projects as per subpart 56-11, negative pressure tent enclosure work areas with glovebag only abatement, or if non-friable ACM is being removed in a manner which will not render the ACM friable.

2. However; if it is found during Phase IIB, that the non-friable ACM or asbestos material will become friable during the removal process, and it is logistically possible to attach the decontamination system enclosure, abatement work shall stop immediately while the remote personal decontamination system is relocated to be attached and contiguous to the regulated abatement work area.

3. The following requirements apply for all remote personal decontamination systems:

(a) Protective Clothing. Workers shall don two (2) sets of disposable protective clothing and a supply of protective clothing shall be kept in the airlocks attached to the regulated abatement work area.

(b) Location. The remote personal decontamination system shall be constructed as close to the regulated abatement work area as physically possible. If the remote personal decontamination system must be located at the exterior of the building/structure due to space or code restrictions, it shall be constructed within fifty (50) feet of the building/structure exit used for access by the asbestos abatement contractor personnel. The decontamination unit shall be cordoned off at a distance of twenty-five (25) feet to separate it from public areas.

(c) Airlocks. At a minimum, two (2) extra airlocks as defined in Section 56- 2.1 shall be constructed as per Section 56-7.5(b)(11). One shall be constructed at the entrance to the equipment room or equipment/washroom. The other extra airlock shall be constructed at

the entrance to the containment or regulated abatement work area(s). These airlocks shall have lockable doorways at the entrance to the airlock from uncontaminated areas. These airlocks shall be cordoned off at a distance of twenty-five (25) feet and appropriately signed in accordance with Section 56-7.4(c). Airlocks shall not be used as a waste decontamination area and shall be kept clean and free of asbestos containing material.

(d) Designated Pathway. The walkway from the regulated abatement work area to the personal decontamination system or next regulated abatement work area shall be cordoned off and signage installed as per Section 56- 7.4(c), to delineate it from public areas while in use during Phase IIA through IID.

(e) Travel Through Uncontaminated Areas. If at any time a worker must travel through an uncontaminated area to access the personal decontamination area, the worker shall HEPA-vacuum and/or wet wipe his/her outer protective clothing while in the regulated abatement work
area, then proceed into the airlock, which serves as a changing area, where he/she shall remove the outer clothing and don a clean set of protective clothing. The worker may then proceed to the personal decontamination system enclosure only along a designated pathway as
described above. Travel in any other area shall not be allowed. Walkways through uncontaminated areas shall be approved by the Owner as to location and may requie additional preparation.

4. The remote personal decontamination unit shall be removed only after satisfactory clearance air sampling results have been achieved.

E. Waste Decontamination System Enclosure - Large and Small Asbestos Projects.

1. *Enclosure – General*. A waste decontamination system enclosure shall be provided outside the regulated abatement work area and shall be attached to the regulated abatement work area. One (1) waste decontamination enclosure for each regulated abatement work area shall be required. This system may utilize adequate existing lighting sources separate from the decontamination system enclosure, or shall be supplied with a GFCI protected temporary lighting system. The waste decontamination system enclosure shall be sized to accommodate the number of workers and equipment for the intended purpose. Such system may consist of existing attached rooms outside of the regulated abatement work area, if the layout is appropriate, that can be plasticized and are accessible from the regulated abatement work area. When this situation does not exist, enclosure systems may be constructed of metal, wood or plastic supports covered with fire-retardant plastic sheeting. A minimum of
one (1) layer of six (6) mil fire-retardant plastic sheeting shall be installed on the ceiling, and walls of the enclosure system. At least two (2) layers of six (6) mil fire-retardant reinforced plastic sheeting shall be used for flooring protection of this area. This system must be kept clean, sanitary and climate controlled at all times in conformance to all federal, state and local government requirements. This system shall remain and be used until completion of Phase II C of the asbestos project.

2. *Rooms and Configuration*. A waste decontamination system enclosure shall consist of a washroom and a holding area connected in series but separated from each other by an airlock. There shall be a lockable door to the outside, and there shall be a curtained doorway between the washroom and the regulated abatement work area.

3. *Curtained Doorway*. An assembly which consists of at least three (3) overlapping sheets of six (6) mil fire retardant plastic over an existing or temporarily framed doorway. One (1) sheet shall be secured at the top and left side, the second sheet at the top and right side, and the third sheet at the top and left side. All sheets shall have weights attached to the bottom to insure that the sheets hang straight and maintain a seal over the doorway when not in use.

4. *Washroom.* A room/chamber between the regulated abatement work area and the holding area in the waste decontamination system enclosure, where equipment and waste containers are wet cleaned or HEPAvacuumed. Adequate drainage and bag/container wash water shall be provided within the room/chamber, as well as a sufficient quantity of clean waste bags/containers.

5. *Equipment/Washroom Alternative*. Where there is only one (1) exit from the regulated abatement work area, the holding area of the waste decontamination system enclosure may branch off from the equipment room of the personal decontamination system enclosure. The equipment room will also be used as a waste washroom.

6. *Plastic Sheeting*. Waste decontamination system enclosures constructed at the work site shall use at least one (1) layer of six (6) mil fire-retardant plastic sheeting on walls and ceiling. At least two (2) layers
of six (6) mil fire-retardant reinforced plastic sheeting shall be used for flooring protection of these areas.

7. *Enclosure Security*. The waste decontamination system enclosure and regulated abatement work area airlock(s) (when remote decontamination systems are used) shall be constructed with lockable doors to prevent unauthorized entry. The contractor shall provide the Owner and the Environmental Monitor with a copy of the key. Enclosures systems located within twenty-five (25) feet of an area of public access shall be fully framed and hard-wall sheathed for safety.

8. *Drains*. The waste washroom shall be equipped with a wash bin of sufficient size to perform waste container washing operations and shall have a submersible pump installed to collect waste water and deliver it to the shower wastewater filtration system where it shall be filtered in accordance with the 5.02 B, of these specifications.

9. *Shower/Washroom Alternative - Small Asbestos Project*. For Small asbestos projects with only one (1) exit from the regulated abatement work area, the shower room may be used as a waste washroom. The
clean room shall not be used for waste storage, but shall be used for waste transfer to carts, which shall be immediately removed from the enclosure. Waste shall be transferred only during times when the
showers are not in use.

10. *Waste Decontamination System* Enclosure – When Remote Personal Is Allowed. When a remote personal decontamination system enclosure is allowed and utilized for a regulated abatement work area, the following requirements shall apply:

    (a) Minor Size Regulated Abatement Work Area. No specific waste decontamination system enclosure is required for minor size regulated abatement work areas. The waste generated shall be immediately bagged/containerized within the regulated abatement work area.

(b) Small & Large Size Regulated Abatement Work Areas.

(c) Washroom. An additional chamber shall be constructed within the regulated abatement work area, attached to the existing airlock used to access the work area. The washroom/airlock combination shall be utilized as the contiguous waste decontamination enclosure for waste bagging/containerization and waste transfer activities. The washroom shall be constructed and supplied with equipment/materials consistent with waste decontamination system enclosure washroom requirements for contiguous personal and waste decontamination system enclosures.

(e) Removal. The washroom chamber shall be removed only after satisfactory clearance air sampling results have been achieved.

5.03 Personal Protective Equipment (PPE)

1. General

a. For the duration of the project and in accordance with OSHA, FRA and New York State Labor Law, The Contractor shall ensure that all employees are provided with the necessary personal protective equipment (PPE). The Contractor shall provide all employees with personal protective equipment appropriate/suitable for the specific work and individual tasks to be performed in accordance with NYS DOL, OSHA and FRA regulations.
Personal protective equipment as required shall include, but not be only limited to, the appropriate/approved hard hats, safety shoes, gloves, goggles, eye/face shield protection, fall protection and arrest devices, safety belts, harnesses, respirators, hearing protection, traffic safety vests, and any other personal protective equipment recommended for use during completion of a specific task or with a particular product.

b. Personal protective equipment shall be provided at no cost to the employee. All costs associated with providing all of the required safety and personal protective equipment (PPE), including the cost of furnishing, maintaining, repairing, and replacing such equipment, shall be assumed by the Contractor.

c. The Contractor and the Contractor's Supervisor shall have the responsibility for monitoring and enforcing proper use of personal protective equipment by employees. Any Contractor employee not in compliance with having or utilizing the appropriate personal protective equipment (PPE) will be removed from the project and the Owner's property. The Contractor is responsible for ensuring employee usage and proper maintenance of personal protective equipment.

d. The Contractor shall provide and maintain sufficient additional supplies of personal protective equipment, suitable for all tasks to be performed throughout the work, for all persons inspecting and visiting the project site, including but not limited to representatives of the Owner, the Engineer, and the Environmental Monitor. In addition to the quantity of respirators to be utilized by the workers performing the work, The Contractor shall make available two (2) additional respirators for use by the Owner's Project Management, Engineer, and/or site inspection personnel as well as a sufficient supply of disposable suits.

e. The Owner requires four (4) types of personal protective equipment be worn by all employees at all times while working on MTA Metro-North Railroad property. The four (4) required pieces of personal protective equipment are listed below.

i. Hard Hat
ii. Safety Glasses
iii. High Visibility Traffic Safety Vest
iv. Work Boots

2. Protective Headwear

The Contractor shall provide hard hats for all employees engaged in the work and shall maintain additional supplies for visitors to the site. All persons within the work zone shall be required to wear hard hats at all times.

3. Protective Footwear

The Contractor shall provide protective footwear for all employees. Suitable footwear consists of work boots having a defined heel and constructed of durable material. The use of sneakers, shoes, loafers, or other non-construction type footwear is prohibited.

4. Protective Eyewear

The Contractor shall supply protective eyewear that meets or exceeds ANSI standards and is suitable for the task being performed. Eyewear may consist of safety glasses, goggles, face shields, full-face respirators or helmets. All persons within the work zone shall be required to eye protection at all times.

5. Eye Wash System

a. The Contractor shall provide, at a minimum, a portable eyewash system at the project site adjacent to the work area. Eyewash systems provided shall meet or exceed the requirements of ANSI Z358.1 *Emergency Eyewash and Shower Equipment*. The Contractor shall be responsible for maintaining and sanitizing the eyewash system as recommended by the manufacturer or more frequently should site conditions warrant.

b. The eye wash facility shall be located in an easily accessible location and made fully functional prior to the start of work. The eye wash facility shall be properly maintained. Eye wash fluid/water shall be replaced and sanitized as per the manufacturer's specifications.

6. Hearing Protection

The Contractor shall provide suitable hearing protection for all tasks involving employee exposure to noise in accordance with OSHA requirements.

7. Traffic Safety Vests

All employees shall be provided traffic safety vests that are to be worn at all times when working on the right-of-way or around rail traffic. The Contractor shall strictly enforce this requirement. The safety vests shall be of high visibility, fluorescent orange or lime green in color, with reflective stripes on the front and back in compliance with ANSI/ISEA 107-1099 Class III.

5.04 Electric Power , Lighting, & Communication Services

A. The Contractor shall provide all required temporary electrical, communications, and lighting service as required for completion of the work, including electric service required by the Environmental Monitor.

B. All electrical work shall conform to the requirements of the National Electrical Code (National Fire Protection Association Standard 70).

C.. As required by the National Electrical Code (NFPA 70), all electrical equipment, shall be properly installed with the necessary Ground Fault Interruption (GFI) devices. The Contractor shall be responsible for the maintenance and operation of the temporary electrical service and proper functioning of GFCI protected circuits. Temporary electrical service power panels shall be fitted with GFCI protected circuit breakers. Temporary electrical work shall conform to the requirements of the New York City Electrical Code, National Electric Code and applicable governmental regulations.

D. Upon approval of the Owner, the Contractor may utilize portable generators for the on site generation of electrical power. The Contractor may provide one or more independent generators capable of providing the electrical capacity required to complete the work. The most suitable location of the generator(s) shall be determined by the Contractor and approved by the Owner. The Contractor shall take into account noise and combustion exhausts associated with generator operation in determining their placement.

E. Prior to the start of work, existing electrical equipment/fixtures within the confines of the work area(s) shall be de-energized. All existing electrical equipment within the work area shall be locked out/tagged out.

F. GFCI protected temporary power shall be introduced to the work area.

G. The Contractor shall supply all necessary extension cords for distribution of electrical power at the project site. Extension cords shall contain three (3) conductors of twelve (12) gauge (AWG) copper wire. Extension cords shall be of manufactured type and shall have three (3) prong terminations; positive, neutral, and ground. Damaged extensions cords and cords having plug ends missing ground prongs shall not be utilized and shall be immediately removed from service and replaced. Shutdown and lock out of electric power to all negative pressure containment enclosures within the regulated abatement work areas shall be required as per current applicable OSHA standards. All existing power to fixtures, lights, machinery and outlets within the enclosure must be shut down and locked out. The Contractor shall provide temporary power and lighting to the regulated abatement work area, and insure safe installation of temporary power sources and equipment used where high humidity or water shall be sprayed in accordance with all applicable codes. All temporary power to regulated abatement work areas shall be brought in from outside the regulated abatement work area. This temporary power shall be protected by a ground fault circuit interrupter (GFCI) before the entry point to the regulated abatement work area. The negative air equipment shall be on GFCI protected circuits separate from the remainder of the regulated abatement work area temporary power circuits. The GFCI temporary power connections shall be located outside of the regulated abatement work area, in a secure, dry area, which is accessible to the Contractor.

(a) Electric Power Shutdown Exemption. If electrical circuits, machinery and other electrical systems in or passing through the regulated abatement work area must stay in operation due to health and safety requirements, the following precautions must be taken:

(1) All unprotected cables (except low-voltage [less than 24 volts] communication and control system cables), panel boxes of cables and joints in live conduit that run through the regulated abatement work area shall be covered with three (3) independent layers of six (6) mil fire retardant polyethylene. Each layer shall be individually duct taped and sealed. All three (3) layers of polyethylene sheeting shall be left in place until satisfactory clearance air sampling results have been obtained.

(2) Any energized circuits remaining in the regulated abatement work areas shall be posted with a minimum of two (2) inch high lettering warning sign which reads: DANGER LIVE ELECTRICAL – KEEP CLEAR. The sign shall be placed on all live covered barriers at a maximum of ten (10) foot intervals. These signs shall be posted in sufficient numbers to warn all persons authorized to enter the regulated abatement work area of the existence of the energized circuits.

H. Work area(s) shall be equipped with adequate temporary GFCI protected lighting. Temporary power connections must be made by the Owners' forces. Request for connection shall be made in advance, allowing sufficient time to accommodate the Owner's forces schedule. A minimum of ten (10) foot-candles of illumination shall be maintained throughout the work site during all working hours in accordance with all applicable federal, state and city laws, codes, rules and regulations including without limitation OSHA Regulations and Standards (1926.56 Illumination). The Contractor shall install auxiliary lighting as necessary. The Contractor shall supply one (1) portable light meter having the appropriate scale to verify conformance with these requirements. Lighting shall be adequately maintained and repaired as necessary to maintain the minimum specified light intensity.

5.05 Engineering Controls

A. Negative Air Pressure Equipment. All asbestos abatement projects shall employ negative air pressure equipment ventilation.

(1) Operation. The negative air pressure equipment shall operate continuously, twenty-four (24) hours a day, from startup of negative air pressure equipment , through the cleanup operations and satisfactory clearance air sampling results being obtained, or the asbestos project is complete.

(2) Timing of Installation. The negative air ventilation units shall be installed and made operational after the critical barriers and isolation barriers are installed.

(3) Negative Air Pressure. A negative air pressure, relative to areas outside of the enclosure, shall be maintained at all times in the regulated abatement work area during the asbestos abatement project to ensure that contaminated air in the regulated abatement work area does not escape back to an uncontaminated area.

(4) Manometer. A manometer shall be used to document the pressure differential for all OSHA Class I Large and Small size asbestos project regulated abatement work areas. A minimum of –0.02 column inches of water pressure differential, relative to pressure outside the regulated abatement work area, shall be maintained within the regulated abatement work area, as evidenced by manometric measurements. Once installed, on a daily basis at least twice per workshift, the asbestos abatement contractor's supervisor shall document the manometer reading within the daily project log. The manometer shall be installed and made operational once the negative air has been established in the regulated abatement work area. Magnahelic manometers shall be at a minimum calibrated

semi-annually, and a copy of the current calibration certification shall be posted at the work site during Phase II operations.

(5) Ventilation Units. If more than one (1) primary HEPA-filtered ventilation unit is installed, the units shall be turned on one (1) at a time and the integrity of temporary hardwall isolation barriers checked for secure attachment or the need for additional reinforcement shall be checked. A minimum of one (1) additional unit having a capacity of at least equal to that of the primary unit shall be installed, as a backup unit to be used upon primary unit failure, or if necessary during primary unit filter changes. Ventilation Unit exhaust ducting shall not exceed twenty-five (25) feet in length, due to reduction in volumetric flow rates caused by friction.

(6) Power Supply. A GFCI protected temporary power supply shall be available to satisfy the equirements of the total of all ventilation units.

(7) Power Failure. In the event of electric power supply failure, abatement shall stop immediately and shall not resume until power is restored and exhaust units are operating fully. In the event of extended power failure (longer than one hour), after evacuation of all persons from the regulated abatement work area, the decontamination system enclosure facilities shall be sealed airtight.

(8) Air Changes. Negative air pressure ventilation equipment shall be installed and operated continuously to provide at least four (4) air changes in the regulated abatement work area every hour including during clearance air sampling.

(9) Openings in Enclosure. Openings made in the enclosure system to accommodate these units shall be made airtight with duct tape or caulking or both. Where possible, the intake side of the negative air ventilation unit shall remain within the regulated abatement work area to permit filter changing, while minimizing equipment contamination and the likelihood of contamination of non-work areas.

(10) Installation and Care. Proper installation procedures, including use of appropriate filters and manufacturer's recommended operating procedures shall be followed.

(i) Each HEPA filter should be individually tested and certified by the manufacturer to have an efficiency of not less than 99.97% when challenged with 0.3 micron particles. Testing shall be in accordance with accepted methodologies, and each filter should bear an appropriate UL label to indicate ability to perform under specified conditions.

(ii) Negative pressure HEPA filtered ventilation units shall be exhausted to the outside of the building or structure and away from public access and to a controllable area.

(iii) Air sampling at exhaust duct termination locations and daily inspections shall be conducted to insure that procedures are followed to maintain the negative pressure air ventilation filtration systems.

(iv) Pre-filters, secondary filters and HEPA-filters shall be replaced when dirty.

(v) Ducts of at least equivalent shape and dimension as those of the negative pressure ventilation exhaust shall be used to exhaust to the outside of the building or structure.

(vi) All fans, ducts and joints shall be sealed, braced and supported to maintain an airtight system.

(vii) Once installed and operational, daily inspections shall be conducted to insure the airtight integrity of the system, and the findings shall be documented by the asbestos abatement contractor's supervisor in the daily project log. Inspection, necessary repairs and documenting is required daily, including days when no Phase IIB or IIC work or support activities are scheduled.

(viii) A four (4) foot high construction fence with appropriate signage in compliance with Section 7.4(c) shall be constructed at a minimum of ten (10) feet

from the end of the exhaust duct tube, or bank of duct tubes, to surround and control this area from public access. For ground level exhaust duct terminations at the immediate exterior of the building/structure, the fence shall be installed at the tube discharge location.

(11) Exhaust Location. The exhaust shall be vented to the outside of the building or structure, to a controllable area away from public access. Each negative pressure ventilation unit exhaust duct shall not terminate less than fifteen (15) feet from a receptor or adversely affect the air intake of any building or structure. If the exhaust duct termination location for this Section cannot be met due to allowable space restrictions or the regulated abatement work area being located above the ground floor, the exhaust shall terminate at the exterior of the building or structure, and all receptors less then fifteen (15) feet from the exterior exhaust duct termination location shall be plasticized with two (2) layers of at least six (6) mil polyethylene. Exhaust tubes may be grouped together in banks of no more than five (5) tubes, with each tube exhausting separately and the bank of tubes terminating together at the same controlled area.

(i) Exception. HEPA-filtered vacuums used to exhaust Minor size tent enclosure regulated abatement work areas, do not require exhausting to the exterior of the building/structure. The use of negative pressure air equipment is not required for the
following:
(i) OSHA Class II non-friable ACM exterior projects;
(ii) asbestos projects where enclosures (i.e. hard walls, tents, etc.) are not required by this Part;
(iii) Controlled demolition asbestos abatement projects.

(12) This exemption does not relieve the Contractor from the negative pressure equipment requirements on other portions of the same project that require the use of negative pressure equipment.

A. **Heating, Ventilation, and Air Conditioning (HVAC) Systems**

(a) Isolation. HVAC systems shall be isolated from the regulated abatement work area. Acceptable means of HVAC system isolation include:

(1) Shutdown and Isolation. Shutdown and isolation of HVAC systems to prevent contamination and asbestos dispersal to other areas of the building or structure.

(2) Local Isolation. Local isolation and provision for temporary HVAC.

(3) Positive Pressurization. Positive pressurization of the HVAC system.

(i) Positive pressurization shall be restricted to circumstances where HVAC must service the remainder of the building or structure and the HVAC equipment is in the regulated abatement work area or the ducts run through the regulated abatement work area. The appropriate HVAC duct and plenum outlets, inlets and exhaust dampers shall be sealed with caulking and a minimum 3/8-inch thickness plywood, or oriented strand board, or sufficient gauge sheet metal, covered with a double layer of at least six (6) mil fireretardant plastic sheeting and duct taped airtight. The HVAC duct and plenum joints shall be duct taped airtight. The mixing and balancing damper positions shall be altered and the return fan(s) shall be shut down to produce the required positive pressures.

(ii) Project phasing, climate conditions, load conditions and HVAC equipment limitations and controls shall be considered when this alternate procedure is evaluated. Aerodynamics in the duct system, particularly spurs or trunks, shall be

considered and, if necessary, the ducts or dampers shall be altered or removed to prevent loss of positive pressure in any part of the system. Precautions shall be taken during abatement activities to ensure that the ducts, seals and static pressure lines are not damaged.

(iii) The presence of positive pressure shall be demonstrated daily by testing, including days when no Phase II work or support activities are scheduled, and the results must be noted in the asbestos abatement contractor supervisor's daily project log. Air sampling in occupied, downstream, non-work areas shall be performed on a daily basis as per the requirements of Section 56-7.1(b)(1) of this Subpart, except days when there are no Phase IIA, IIB, or IIC activities. Positive pressure verification shall be done on a
continuous basis. The differential pressure shall be easily verifiable by use of a leak free, rigid static pressure taps, static lines on the supply and return ducts and static lines originating in the regulated abatement work area, adjacent areas or downstream non-work areas.

(b) HVAC Filters and Ducts. Potentially contaminated HVAC filters in existing building/structure HVAC systems shall be handled and disposed of as asbestos contaminated waste material. The ducts and filter assembly shall be wet cleaned and HEPA-vacuumed where system air samples or bulk samples indicate asbestos contamination within the interior of the HVAC ducts. Existing building/structure HVAC system filters shall be treated as potentially contaminated for all friable OSHA Class I and Class II asbestos projects, and shall be removed and disposed of by the asbestos abatement contractor after the affected filters are identified by the building/structure owner's HVAC contractor or maintenance personnel. The building owner or their agent shall supply appropriate replacement HVAC system filters to the asbestos abatement contractor during HVAC system filter removal and replacement.

(c) Chimney Effects. All boilers and other equipment exhausts within the regulated abatement work area shall be shut down and the burner/boiler/equipment accesses and openings shall be sealed until abatement is complete and satisfactory clearance air-sampling results have been achieved. If the boiler(s) or other exhausted equipment will be subject to abatement, all breeching, stacks columns, flues, shafts and double-walled enclosures serving as exhausts or vents, shall be segregated from the affected boilers or equipment and sealed airtight to eliminate potential chimney effects within the regulated abatement work area.

5.06 Work Area Pre-Cleaning

(a) Movable Objects. Movable objects within the regulated abatement work area shall be precleaned using HEPA-filtered vacuum equipment and/or wet cleaning, and such objects shall be removed from the regulated abatement work area to an uncontaminated location. Upholstered furniture and drapes shall be HEPAvacuumed twice before removal from the regulated abatement work area. Carpeting shall be HEPA-vacuumed twice and cleaned before removal from the regulated abatement work area. If disposed of as asbestos-contaminated waste material, cleaning of carpeting is not required. If carpeting is left in place, it shall be covered with three-eighths (3/8) inch thick plywood sheathing prior to required
plasticizing.

(b) Fixed Objects. Fixed objects and other items which are to remain within the regulated abatement work area shall be precleaned using HEPA-filtered vacuum equipment and/or wet

cleaning methods. Such objects and items shall be enclosed with two (2) layers of at least six (6) mil fire retardant plastic sheeting and sealed airtight with duct tape.

(c) Precleaning. The regulated abatement work area shall be cleaned using HEPA filtered vacuum equipment or wet cleaning methods or both. Methods that raise dust, such as sweeping or vacuuming with non HEPA-filtered equipment shall be prohibited. ACM, PACM or asbestos material shall not be disturbed during precleaning. Precleaning is intended for preparation work, not gross cleaning of
visible asbestos debris such as disturbed ACM, PACM or asbestos material on floors or other work area surfaces. Precleaning shall be performed in the following order.

(1) Locations in which critical barriers and isolation barriers are to be installed shall be cleaned first using a HEPA-filtered vacuum and wet cleaning methods before the barriers are installed. After the critical barriers and isolation barriers are installed, the negative air ventilation units shall be started. Once the negative air ventilation units are operational, the remainder of the precleaning shall take place and area plasticization shall begin.

5.07 Work Area Enclosure.

(a) Critical Barriers. Critical barriers shall be constructed to seal off all openings and penetrations to the regulated abatement work area including, but not limited to, operable windows and skylights, doorways and corridors (which shall not be used for passage), ducts, grills, diffusers, HVAC system seams, and any other penetrations to surfaces within the regulated abatement work area. Critical barriers shall be constructed using two (2) independent layers of at least six (6) mil fire-retardant plastic sheeting with each layer sealed separately with duct tape. Caulk and fire-retardant expandable foam may be used to seal small openings or penetrations. Doorways and corridors, which shall not be used for passage during the asbestos project, shall also be sealed.

(b) Isolation Barriers. Temporary hardwall barriers to complete the containment enclosure and establish the asbestos project regulated abatement work area shall be constructed using the following framing, sheathing, sealing and plasticizing criteria:

(1) Framing. Isolation barrier partitions shall be constructed of wood or metal framing in all openings larger than thirty-two (32) square feet, except that where any one dimension is one foot or less, framing is not required. Existing walls or framing may be used to support isolation barrier partition framing and sheathing.

(2) Sheathing. A plywood or oriented strand board (OSB) sheathing material of at least 3/8-inch thickness shall be fastened to the regulated abatement work area side of the barrier partition.

(3) Sealing of Isolation Barriers. The edges of the isolation barrier partition shall be sealed at the floor, ceiling, walls and fixtures using caulk, fireretardant expandable foam or duct tape to form an airtight seal. The
seams of the partition sheathing shall also be sealed airtight using these techniques.

(4) Plasticizing Isolation Barriers. The regulated abatement work area side of the isolation barrier partition shall be covered with two (2) layers of, at a minimum, six (6) mil fire-retardant plastic sheeting with staggered joints and sealed airtight.

(c) Removal of Mounted Objects. After critical barriers and isolation barriers are in place, mounted objects shall be removed and HEPA-vacuumed or wet wiped or both. Localized HEPA-filtered vacuum equipment shall be used during mounted object removal to reduce potential asbestos dispersal.

(d) Elevator Shutdown or Isolation. Elevators running through the regulated abatement work area shall be shut down except as noted in this Subdivision:

(1) Isolation Detail. In projects where the elevator cannot be shut down, the hoistway door frames shall be enclosed with nominal 2" x 4" framing, 16 inch on center, covered with 3/8-inch thickness plywood or OSB sheathing, and caulked or duct taped airtight at all seams. The enclosures shall be covered with two (2) seamless layers of at least six (6) mil plastic sheeting duct taped and sealed airtight. A final larger layer of at least six (6) mil plastic sheeting shall be duct taped and sealed airtight, but with slack, forming a larger perimeter diaphragm to sense air movement caused by elevator operation.

(2) Elevator Shaft Ports. Elevator shaft ports for pressure equalization when within the regulated abatement work area, shall be vented to the outside or non-work areas using oversized solid-walled ducts or chambers constructed with 3/8-inch thickness plywood or OSB sheathing over
nominal 2" x 4" framing, 16 inch on center. The joints shall be caulked and the ducts or chambers shall be sealed with two (2) layers of at least six (6) mil fire-retardant plastic sheeting and duct tape. The first layer of plastic sheeting shall be attached to the ducts or chambers using spray adhesive. This system shall be subjected to and pass a negative pressure
test daily.

(e) Floor, Wall & Ceiling Plasticizing and Sealing. All floor, wall and ceiling surfaces, except where abatement of ACM, PACM or asbestos material shall be performed on those specific surfaces, shall be covered with two (2) layers of, at a minimum, six (6) mil fire-retardant plastic sheeting. The floor shall be plasticized first, and its plastic sheeting shall extend up the walls a distance of at least twelve (12) inches on all sides. The walls shall then be plasticized by applying plastic sheeting from the ceiling to the floor, overlapping the floor sheeting by at least twelve (12) inches. Next, the ceiling shall be plasticized overlapping the walls by at least twelve (12) inches, to form a secure airtight seam. This process shall be repeated for the second layer of plastic sheeting for the floor, walls and ceiling. All seams within a layer shall be separated by a distance of at least six (6) feet and sealed airtight with duct tape. All seams between layers shall be staggered at least two (2) feet.

(f) Barrier/Plasticizing Exemptions.

(1) Negative Pressure Tent Regulated Abatement Work Area Enclosure.
An alternate isolation method may be used where preparation of the entire room/space is either unfeasible or not necessary to adequately access all impacted ACM, PACM or asbestos material.

(i) Where Allowed. Negative pressure tent enclosures are allowed to be utilized for gross abatement of any quantity interior and exterior non-friable ACM or asbestos material, glovebag abatement of any quantity friable TSI, or gross abatement of Minor and Small quantities of friable ACM, PACM or asbestos material. For tent enclosures with gross abatement of friable materials, attached (contiguous) decontamination system enclosures shall be constructed, maintained and utilized as per this Part. Minor size tent enclosure work areas shall at a

minimum have decontamination areas installed and utilized, as per the requirements of Section 56-11.3.

(a) Multiple Minor Size Regulated Abatement Work Areas. If the small or large asbestos project consists of multiple negative pressure tent regulated abatement work area enclosures with minor quantities of ACM to be abated within each tent enclosure, these tent enclosures shall be constructed as per this Subpart, including attached airlock if remote decontamination systems are allowed and utilized for the asbestos project.

(ii) Tent Construction.

(a) Tents with greater than twenty (20) square feet of floor space, or tents that are scheduled for gross removal of friable ACM, PACM, or asbestos material, shall be constructed of two (2) layers of six (6) mil fire-retardant plastic sheeting and shall include walls, ceiling and a floor (except for portions of walls, floors and ceilings that are the removal surface) with double-folded seams. Seams shall be duct taped airtight and then duct taped flush with the adjacent tent wall.

(b) Tents with twenty (20) square feet or less of floor space and no gross removal of friable ACM, PACM or asbestos material, shall be constructed of one (1) layer six (6) mil fire retardant plastic sheeting and shall include walls, ceiling and a floor (except for portions of walls, floors and ceilings that are the removal surface) with double-folded seams. Seams shall be duct taped airtight and then duct taped flush with the adjacent tent wall.

(c) Tents or tent-like structures or enclosures shall be adequately supported and reinforced to withstand local environmental conditions and the negative pressures developed within them.

(d) Airlock. An airlock shall be constructed as per Section 56- 7.5(b)(11), at the entrance to each tent that utilizes remote decontamination system facilities. Each tent and airlock shall be cordoned off twenty-five (25) feet from it perimeter, or the interior space/room where the tent and airlock is located shall be secured from non-certified personnel or public access, and signage shall be installed as per Section 56-7.4(c).

(iii) Negative Air. Manometers consistent with the requirements of Section 56-7.8(a)(4), are required for negative pressure tent enclosure regulated abatement work areas with OSHA Class I abatement. Negative air shall be maintained at four (4) air changes per hour for non-friable and glovebag abatement tent enclosure work areas. Eight (8) air changes shall be maintained for friable gross removal tent enclosure work areas. If a HEPA-filtered vacuum is used for a Minor size abatement tent enclosure work area to maintain the required air changes, after final cleaning is completed twenty (20) minutes shall elapse, then ventilation may be stopped, clearance air samples collected if required, and the tent sealed until results are read. If air sample results are unacceptable, ventilation shall be re-established, the area recleaned and new samples taken.

(2) Fire-Retardant Spray Plastic. Fire-retardant spray plastic may be used in lieu of two (2) layers of six (6) mil plastic sheeting as required by 56- 7.11(e), under the following conditions:

(i) Critical barriers are installed per Section 56-7.11(a) of this Part.

(3) Special Projects. See Subpart 56-11 regarding work area preparation requirements for special projects. These projects include exterior nonfriable ACM roofing, siding, caulking, glazing compound, transite, tars, sealers, coatings, and other NOB ACM abatement, abandoned intact pipe/duct/conduit wrap and cut abatement, flooring and mastic abatement,
pre-demolition abatement, demolition with asbestos in place, in-plant operations abatement, emergency project abatement and Minor size project abatement.

(4) Removal of Ceilings and Components. Suspended ceiling and components that exist below friable ACM or PACM material, and that are not themselves ACM or PACM, shall remain in place until the remainder of the regulated abatement work area has been plasticized, negative air established, and personal and waste decontamination enclosures have been constructed. The ceiling tiles and components shall then be removed and disposed of as asbestos waste or decontaminated if possible. This type of removal must be done prior to commencement of
Phase II B abatement, but after the remaining regulated abatement work area preparation has been completed. Critical barriers shall be installed above the suspended ceiling as per Section 56-7.11(a), prior to the commencement of Phase IIB abatement.

(5) Exits. Emergency and fire exits from the regulated abatement work area shall be maintained or alternate exits shall be established and appropriately signed according to all applicable codes. Temporary hardwall barriers are not required at emergency and fire exit locations.

(g) Toilet Facilities. Adequate toilet facilities shall be readily accessible to the personal decontamination enclosure. Toilets shall conform to Section 11.09 of these specifications.

5.08 AIR Monitoring

Air Sampling Requirements.

(a) Personal Air Sampling. The contractor shall conduct air sampling in the worker's breathing zone, as required by OSHA regulations and these specificaitons. The Contractor shall provide results of personal air monitoring to the Owner upon receipt from the laboratory.

(1) Work Stoppage Criteria During Phase II B Abatement Procedures. If air samples collected outside the regulated abatement work area, indicate airborne fiber concentrations at or above 0.01 fibers per cubic centimeter, or the established background level, whichever is greater, work shall stop immediately for inspection and repair of barriers and negative air ventilation systems as necessary. Clean up of surfaces outside of the regulated abatement work area using HEPA-vacuums and wet-cleaning methods shall be performed prior to resumption of abatement activities. A summary of clean up activities and the results of barrier inspections including any necessary repairs, shall be documented in the supervisor's daily project log. Work methods shall be altered accordingly to reduce fiber concentrations to acceptable levels.

5.09 Access to and Maintenance of Decontamination Systems and Work Area Enclosures.

(a) Access. Entry to the personal and waste decontamination system enclosures shall be restricted to the Contractors involved with the asbestos project, appropriately certified employees of the Contractors, authorized visitors, police, fire and other public safety personnel.

(b) Waiting Periods. Prior to beginning Phase IIB asbestos abatement work and upon completion of the construction of all Small and Large size regulated abatement work area enclosures and decontamination system enclosures, including establishment of the negative air system, a four (4) hour waiting period
with negative air units operating shall be required to ensure that all barriers shall remain intact and secured to the walls, ceilings, floors and fixtures.

(c) Waiting Period Exemption. The four (4) hour waiting period may be eliminated for exterior work where negative air is not required.

(d) Inspection of Barriers. All barriers shall be inspected by the Contractor's supervisor at least twice daily, before the start of and following the completion of the day's abatement activities. Inspections are also required on days when there is no Phase II work or support activities scheduled. Inspections and observations shall be documented by the Contractor's supervisor in a daily project log.

(e) Repairs to Barriers and Enclosures. Damage and defects in the barriers and enclosures shall be repaired immediately upon discovery and shall be documented by the asbestos abatement contractor's supervisor in a daily project log, prior to resumption of abatement activities.

(f) Testing of Barriers and Enclosures. Smoke tube testing to ensure the effectiveness of all isolation barriers, personal decontamination system enclosures, waste decontamination system enclosures and regulated abatement work area enclosures shall be performed prior to the beginning of abatement
activities and at least once a day thereafter until satisfactory clearance air sampling results have been obtained. Negative air pressure ventilation units shall be in operation during this testing. Testing of barriers and enclosures is not required on days when there are no Phase IIB or cleaning activities scheduled. Test results, observations and any modifications shall be documented by the asbestos abatement contractor's supervisor in a daily project log.

(g) Loss of Enclosure Integrity. If visible emissions or water leaks are observed outside of the regulated abatement work area, or if a glovebag, tent or enclosure of any type fails or loses its integrity, work shall be stopped and the following procedures shall be followed:

(1) Isolation and Critical Barrier Construction. Isolation and critical barriers shall be constructed as follows:

(i) Isolate HVAC Systems. The HVAC systems shall be shut down immediately and all openings shall be sealed with at least six (6) mil fire retardant plastic sheeting and duct tape.

(ii) Isolate Uncontaminated Areas. Passageways to uncontaminated areas of the building or structure shall be sealed with at least six (6) mil fire retardant plastic sheeting and duct tape.

(iii) Install Critical Barriers. Critical barriers within 25 feet of the regulated abatement work area shall be installed as per Section - 7.11 of NYCRR Part 56.

(2) Negative Air Pressure Equipment Ventilation. Negative air pressure equipment ventilation that complies with Section 56-7.8 of this Part shall be installed and utilized.

(3) Cleanup. Cleanup shall be accomplished as follows:

(i) Method, Tools and Equipment. All accumulations of asbestos waste material shall be containerized and removed. Non-metal shovels and HEPA-vacuums may be used to pick up or move waste except in the vicinity of isolation barriers which might be breached. The areas around isolation barriers shall be cleaned utilizing rubber or plastic dustpans, squeegees or shovels. HEPA vacuums shall be used to clean all surfaces after gross cleanup.

(ii) Cleanup of Surfaces. All surfaces in the regulated abatement work area shall be wet-cleaned using rags, mops and sponges.

(iii) Second Cleaning. After the first cleaning, at least twelve (12) hours shall be allowed for asbestos to settle. Thereafter, all objects and surfaces in the regulated abatement work area shall be HEPA vacuumed and wet-cleaned. All windows, doors, HVAC system vents and all other openings shall remain sealed.

(4) Removal of Contaminated Equipment and Waste. All remaining contaminated equipment and containerized waste shall be removed from the regulated abatement work area.

(5) Clearance Air Sampling. Clearance air sampling shall be conducted, as per the schedule for air sampling and analysis.

(6) Isolation Barrier Removal. Isolation barriers shall be removed only after satisfactory clearance air sampling results have been achieved.

(h) Daily Cleaning of Enclosures.
The asbestos abatement contractor shall HEPA-vacuum or wet-clean the waste decontamination system enclosures, the personal decontamination system enclosures, and airlocks when remote decontamination units are used, daily during Phase II A through C abatement activities. This cleaning shall take place at the end of each work shift and the asbestos abatement contractor's supervisor shall document it in the daily project log.

5.10 Work Area Entry and Exit Procedures

(a) Procedures. The following procedures shall be followed throughout the asbestos abatement project until satisfactory clearance air-sampling results have been achieved:

(1) Entry to the Work Area. All persons shall enter the regulated abatement work area through the personal decontamination system enclosure, or through an airlock when used with an approved remote decontamination unit.

(i) Entry/Exit Log. All persons who enter the regulated abatement work area or enclosure shall sign the entry/exit log, located in the clean room, upon every entry and exit.
(ii) Knowledge of Procedures. All persons, before entering the regulated abatement work area or enclosure, shall read and be familiar with all posted regulations, personal protection requirements, including regulated abatement work area entry and exit procedures and emergency procedures. The entry/exit log headings shall indicate, and the signatures shall be used to acknowledge that these have been reviewed and understood by all persons prior to entry.
(iii) Personal Protective Equipment. All persons shall proceed first to the clean room, remove all street clothing, store these items in lockers and don personal protective equipment as appropriate for the abatement work area. Two (2) layers of protective clothing shall be donned for entry to regulated abatement work areas from remote personal decontamination systems. All authorized visitors shall also don NIOSH-approved respiratory protection for work areas with negative air established. Respirators and personal protective equipment shall be utilized by each authorized visitor for each separate entry into the regulated abatement work area. Respirators shall be inspected prior to each use and tested for proper seal using positive and negative pressure fit checks.
(iv) Tools. Persons wearing designated personal protective equipment shall proceed from the clean room through the shower room to the equipment room, where necessary tools are collected and any additional clothing shall be donned, before entry into the regulated abatement work area.

(2) Exit From the Work Area. All persons shall exit the regulated abatement work area through the personal decontamination system enclosure, or through an airlock when used with an approved remote decontamination unit.

(i) Removal of Gross Contamination. Before leaving the regulated abatement work area, all persons shall remove gross contamination from the outside of respirators and protective clothing by HEPA vacuuming, or wet cleaning.
(ii) Exit. All persons shall exit the regulated abatement work area through the personal decontamination system enclosure, or through an airlock when used with an approved remote decontamination unit, except in case of an emergency, when an emergency exit or other means of escape may be used.

(iii) Regulated Abatement Work Area Exit Procedures Utilizing Remote Decontamination Systems. If at any time a person has to travel through an uncontaminated area to access the personal or waste decontamination enclosure system, the person shall HEPA vacuum and/or wet wipe his/her outer protective clothing while in the regulated abatement work area, then proceed into the airlock
where he/she shall remove his/her outer clothing and don a clean set of protective clothing. He/she may then proceed to the personal or waste decontamination enclosure along a designated pathway. The walkway from the regulated abatement work area to the decontamination system shall be cordoned off to delineate it from public areas, as per Section -7.5(d)(4) of NYCRR Part 56.
(iv) Removal of Personal Protective Equipment. Persons shall proceed to the equipment room where coveralls, head covering, foot covering and gloves shall be removed. Disposable clothing shall be deposited into labeled containers for disposal. Reusable contaminated clothing, footwear, head covering and gloves

shall be stored in the equipment room when not being used in the regulated abatement work area. Respirators shall not be removed during this process.

(v) Showering. Still wearing respirators, persons shall proceed to the shower area, clean the outside of the respirator and the exposed face area under running water prior to removal of the respirator, and fully and vigorously shower and shampoo to remove residual asbestos contamination. Respirators shall be washed thoroughly with soap and water. Some types of respirators shall require slight modifications to these procedures. An airline respirator with a HEPA-filtered disconnect protection shall be disconnected in the equipment room and worn into the shower. A powered air-purifying respirator facepiece shall be disconnected from the filter/power pack assembly prior to entering the shower.

(vi) Clean Room. After showering and drying, all persons shall proceed to the clean room and shall don either street clothing, if exiting the enclosure, or clean personal protective equipment if returning to another regulated abatement work area.

5.11 Handling and Removal Procedures.

(a) Glovebag Procedures. Glovebags are allowed to be utilized for abatement of pipe or duct insulation within negative pressurized regulated abatement work area enclosures. Glovebags may only be used on piping and ducts up to 150 degrees Fahrenheit. The following procedures must be followed for glovebag use:

(1) Size. When abating pipe or duct insulation, the pipe or duct insulation diameter worked shall not exceed one half the bag working length.

(2) Sealing. Duct tape shall be placed securely around the area of abatement to form a smooth seal. The glovebag shall then be secured to the duct tape and sealed airtight.

(3) Seal Testing. After placement, each glovebag shall be subjected to and pass a smoke test as follows:

(i) Smoke testing should not be completed using a positive pressure test. The glovebag, once secured in place, should be placed under negative pressure, utilizing the HEPA-vacuum, and a smoke tube should be aspirated to direct smoke at all seals and seams from outside the glovebag.

(ii) If there are any leaks, they will be detected by the smoke entering the bag. All leaks shall be duct taped airtight.

(4) Surface Irregularities. If material adjacent to the work section is damaged, or if it terminates, is jointed or contains an irregularity adjacent to the work section, the material shall be wrapped in at least six (6) mil fire-retardant plastic sheeting and sealed airtight with duct tape.

(5) Post-Stripping Wetting. After the asbestos material has been stripped, the surface from which it has been removed shall be wetted with amended water and scrubbed with a brush or abrasive pad to remove all visible asbestos material. The surfaces from which it has been removed, the interior of the bag, the affected area and the tools shall then be thoroughly
wetted with amended water.

(6) Sealing of Pipe Ends. When abating pipe insulation, any pipe insulation ends created shall be sealed with wettable cloth or otherwise encapsulated with a non-asbestos product.

(7) Collapsing of the Glovebag. A HEPA-vacuum shall be used to collapse the glovebag.

(8) Tool Segregation. With the glovebag collapsed and the asbestos material in the bottom of the bag, twist the bag several times and duct tape the twist to seal that section.

The tool pouch shall be separated from the bag by twisting it several times, taping the twist and thus sealing the
pouch. Alternately, the tools may be segregated using one or both glove inserts and pulling the tools through, thus turning the glove inside out. The glove(s) shall then be twisted several times, duct taped and thus sealed.
(9) Sealing the Contaminated Items. The glovebag shall be tied off to contain the asbestos material prior to the glovebag being detached from the area where the asbestos was removed within the bag.
(10) Containerizing the Glovebag. The sealed glovebag shall be placed into at least a six (6) mil plastic bag, sealed airtight and transferred from the regulated abatement work area as per Section 56-8.9, for disposal as asbestos waste.
(11) Failure. The requirements of Section 56-8.2(g) shall be complied with in the event of glovebag losing seal or integrity.

(b) Dry Removal or Dry Disturbance. No dry removal or dry disturbance of asbestos material shall be permitted.

(c) Wetting Requirements. The asbestos material shall be adequately wetted with amended water. Sufficient time shall be allowed for penetration to occur prior to abatement activities. All friable asbestos materials shall be thoroughly saturated. All non-hygroscopic (material that resists wetting) asbestos material shall be thoroughly wetted, prior to and during abatement.

(d) Asbestos Abatement. Only one type of asbestos containing material shall be abated at a time within an enclosure. Prior to the abatement of another type of asbestos containing material, the area shall be cleaned.

(e) Handling. ACM, PACM and asbestos material, on detachment from the substrate, shall be directly bagged or dropped into a flexible catch basin and subsequently bagged or containerized. Materials removed in negative pressure tent enclosure work areas shall be bagged or containerized immediately upon detachment. Additional amended water shall be added as necessary to the waste bags/containers to ensure that all waste remains adequately wet within the bag/container.

(f) Sealing of Surfaces and Edges. Where ACM, PACM or asbestos material was removed, any exposed edges of material that remain shall be sealed with wettable cloth or otherwise encapsulated with a suitable non-asbestos material, prior to commencement of final cleaning and collection of clearance air samples.

(g) Exterior Chutes. For asbestos material lowered or conveyed greater than ten (10) feet in height, dust tight, enclosed, inclined chutes shall be used as follows:

(1) The upper end of the chute shall be furnished with a hinged lid to be closed when a chute is not being used,
(2) The chute shall be dust tight along its lateral perimeter and at the terminal connection to a dumpster or container with a hard wall and a hard top.

(h) Handling Large Components. Large components, removed intact, shall be wrapped in two (2) layers of at least six (6) mil plastic sheeting secured and made air tight with duct tape.

(i) Sharp-Edge Components. Asbestos waste material with sharp edged components that may tear or damage the plastic bags or sheeting shall be placed in a poly lined hard wall container or a rip proof bag then double bagged or wrapped and sealed airtight.

(j) Loss of Integrity on Asbestos Projects. If a regulated abatement work area enclosure of any type, including a negative pressure tent enclosure, fails or loses its integrity, the required procedures of Section 56-8.2(g) shall be followed.

5.12 ACM Waste Clean-Up Procedures

The following procedures shall be required for Phase II B Large and Small projects.

(a) Tools and Equipment. All accumulations of asbestos waste material shall be adequately wetted and containerized using HEPA-vacuums or rubber or plastic dustpans, squeegees or shovels. Metal shovels shall not be used to pick up or move waste. HEPA-vacuums shall be used to clean all surfaces after gross cleanup.

(b) Frequency for Containerizing. During Phase II B, all waste generated shall be bagged, wrapped or containerized immediately upon removal. Cleanup of accumulations of loose debris/waste material shall be performed whenever enough loose debris/waste material has been removed to fill a single leak-tight
container appropriate for the type of ACM being removed. Cleanup of all remaining waste generated shall be performed at least once prior to close of each workshift. All waste material shall be kept adequately wet at all times.

(c) Frequency for Dust or Debris. Accumulations of dust or debris shall be cleaned off all surfaces on a daily basis using HEPA-vacuum or wet-cleaning methods or both.

(d) Frequency for Decontamination System Enclosures. Decontamination system enclosures shall be HEPA-vacuumed or wet-cleaned or both at the end of each workshift.

(e) Waste Housekeeping. The regulated abatement work area, holding area, waste trailer and hardtop dumpster areas must be kept free of uncontainerized asbestos waste/debris at all times.

5.13 Multiple Abatement within a Single Regulated Abatement Work Area

(a) Simultaneous Abatement. Simultaneous or concurrent abatement of multiple types of ACM within a single regulated abatement work area shall not be allowed, unless the multiple types of ACM are part of the same system (e.g. floor tile/cove base and mastics, or ceiling/wall tile and mastic). Simultaneous
removals are allowed on a project provided they are within different regulated abatement work areas.

(b) Requirements for Sequential Abatement. When multiple types of abatement work are done in a common regulated abatement work area or enclosure, a sequential order of abatement is required as shown below.

(1) Initial Plasticizing. Initial plasticizing of the containment area shall be as required for the most stringent case of removal.

(2) Sequential Removal. Sequential removal shall allow for only one type of removal of ACM at a time in a sequential order within the work area until that type of material is completely removed. Thereafter, another type of ACM can be removed within the same work area. Relief from plasticizing is for the surfaces to be abated only at the time of that

specific material abatement. Other surfaces shall be plasticized as the material being abated dictate, except as noted below.

(i) Order of Sequential Abatement. The following sequence of abatement within a work area shall begin at the ceiling or upper level and progress one material at a time down to the floor and from most friable material to least friable material.

(ii) Example:

(a) First. All ceiling fireproofing, ceiling plaster or similar ceiling OSHA Class I friable material shall be completely abated so that no visible exposed ACM, PACM or asbestos material remains. Then the friable mechanical/tank insulation, isolation/ vibration damper material and thermal pipe, ducts, pipe fitting insulation, mudded firebrick, or similar OSHA Class I or Class II friable material shall be completely abated so that no visible exposed material remnants remain. Glovebags may be used. After all friable ACM has been abated, the area shall be cleaned of all debris/residue using HEPA vacuuming and wet wiping.

(b) Second. OSHA Class II non-friable materials shall be abated. If other areas/surfaces were abated, no new plasticization shall be required. Ceiling and wall tiles, transite, interior window glazing, expansion joint, millboard and other NESHAP Category I and II non-friable ACM shall be abated so that no visible exposed material remnants
remain and the area shall be cleaned of all debris/residue using HEPA vacuuming and wet wiping.

(c) Last. OSHA Class II non-friable flooring abatement shall be last. Non-friable ACM flooring materials and ACM mastic shall be abated so that no visible exposed material remnants remain and the area shall be cleaned of all debris/residue using HEPA vacuuming and wet wiping. If beadblaster or a similar abrasive type of abatement method is used, full work area preparation, including establishment of negative pressure filtration systems, shall be required and this abatement may be done as one of the first types of abatement and then the flooring area abated shall be replasticized with a double-layer of six (6) mil fire retardant plastic sheeting, to be utilized as a dropcloth during the remaining abatement.

(iii) Temporary Walls. New temporary hardwalls used to separate an enclosed regulated abatement work area into smaller regulated abatement work area enclosures shall be constructed as per Section 56-7.11(b). Existing columns, I-beams and interior walls may be used to support or to act as part of the new containment walls provided that the existing walls, columns, and I-beams to which these temporary walls are to be attached or used shall be completely abated prior to the erection of these new containment walls to allow this attachment. Caulk, fire-retardant expandable foam or duct tape shall be used to form an airtight seal for these partitions.

(a) Airlock. Each newly enclosed regulated abatement work area shall have an attached airlock as defined in Section 56- 2.1, and the airlock shall be constructed at the enclosure entrance, as per Section 56-7.5(b)(11). Each enclosure and airlock shall be cordoned off twenty-five (25) feet from its perimeter. Critical openings within the cordoned off area shall be covered with two (2) layers of six (6) mil fire retardant polyethylene in conformance to Section 56-7.11(a).

(iv) Intermediate Completions. On completion of each type of asbestos abatement within these work area enclosures, a complete single cleaning of all surfaces in the entire area – ceiling, walls and floors - shall be performed by

HEPA vacuuming and wet wiping. No final clearance air samples shall be required for each individual type of material abatement, until the last type of ACM, PACM or asbestos material is abated. Each intermediate completion shall include a visual inspection for completeness by the Contractor's supervisor. Results of the visual inspection and time of intermediate completion shall be documented by the asbestos abatement contractor's supervisor in the daily project log.

(v) Final Required Cleaning. A complete single clean of all surfaces in the entire area – ceiling, walls and floors, followed by a visual inspection as described in Subpart 56-9, NYCRR shall be performed by HEPA vacuuming and wet wiping, after all abatement is complete.

(vi) Final Clearance Air Samples. After the final cleaning and visual inspection requirements are completed and the final settling/drying period is observed, prior to dismantling the regulated abatement work area, Phase IIC final clearance air samples shall be collected and satisfactory clearance air results obtained as per Section 56-
9.2 of this Part.

5.14 Encapsulation / Encasement / Enclosure Procedures

1.All material used for repair or encapsulation of asbestos material shall have a flame spread rating, fireproofing and smoke characteristics similar to the material being repaired or encapsulated. Also, the encapsulant shall not alter the insulating characteristics of the material subject to encapsulation, and the encapsulant shall not add excess weight to the material increasing the potential that the material may delaminate from itself (cohesion failure), or from its substrate (adhesion failure). Encapsulation of asbestos material shall be conducted in accordance with the following:

(a) Regulated Abatement Work Area Preparation. The regulated abatement work area shall be pre-cleaned, isolated and negative air established in accordance with Subpart 56-7 of this Part.

(b) Repair Materials. Damaged and missing areas of existing materials shall be repaired with non-asbestos material. The material shall adhere to existing surfaces and provide a base for application of encapsulating agents.

(c) Asbestos Material Removal. Loose or hanging ACM, PACM or asbestos material shall be removed in accordance with the requirements of Section 8.4 of NYCRR Part 56.

(d) Testing of Encapsulants. Encapsulants shall be field tested prior to use by applying each to a small area to determine suitability for the material to be encapsulated. Testing shall be conducted only after the isolation barriers are in place and negative air has been established.

(e) Bridging Encapsulants.

(1) Thickness Requirements. Bridging encapsulants shall be applied to provide the manufacturer's specified minimum dry-film thickness over sprayed asbestos surfaces.

(2) Color Requirement. When using bridging encapsulant, a different color for each coat shall be used.

(f) Latex Paint. Latex paint shall not be used as a bridging encapsulant. It shall be considered a dilute lockdown encapsulating agent and used only as a coating for lockdown purposes for surfaces during cleanup procedures as per Subpart 56-9.

(g) Penetrating Encapsulants.

(1) Penetration Requirements. Penetrating encapsulants shall be applied and penetrate existing asbestos material to the substrate.

(2) Testing of Penetration. During treatment with a penetrating encapsulant, selected random core samples of asbestos material shall be removed and checked to verify full depth of penetration.

(3) Color Requirement. Each coat of penetrating encapsulant shall be color coded as per manufacturer's recommendations, if any, except for the prohibition of pigment use.

(h) Methods of Application. Encapsulants shall be applied using airless spray equipment as follows:

(1) Spraying Pressure. Spraying shall be performed at the lowest pressure range possible to minimize asbestos fiber release.

(2) Spray Tip. The optimum spray tip shall be chosen on the basis of the viscosity and percent solids of the encapsulant. The cone projection of the tip shall be as specified by the manufacturer.

(3) Subsequent Coats. Each subsequent coat of encapsulant shall be applied at a 90-degree angle to the preceding coat application or per manufacturer's specifications.

(4) Encapsulant Solvent or Vehicle. The encapsulant solvent or vehicle shall not be or contain a volatile material. It shall not release hazardous air pollutants, as defined by NYS DEC 6 NYCRR 200.1(ag), into the air when applied or during curing.

(i) Encapsulant Fire-Resistance Properties. If the asbestos material has been used for fire retardation or protection of structural members or both, the encapsulant material used shall have a flame spread rating, fireproofing and smoke characteristics similar to the material being repaired or encapsulated.

(j) Marking or Labeling. Encapsulated ACM, PACM, or asbestos material shall be conspicuously marked or labeled in order to warn persons of its presence.

(k) Cleanup. Waste cleanup shall be in accordance with NYCRR Part 56, Section -8.5.

(l) Final Cleaning and Clearance Air Sampling. Final cleaning and clearance air sampling shall be in accordance with Subpart 56-9.

2. Encasement, Enclosure Procedures. The encasement/enclosure of existing ACM, PACM or asbestos material shall be conducted
in accordance with the following:

(a) Regulated Abatement Work Area Preparation. The regulated abatement work area shall be pre-cleaned, isolated and negative air established in accordance with Subpart 56-7 of this Part.

(b) Use of Amended Water. Areas that may be disturbed during the installation of hangers or other support and framing materials for the enclosure shall be sprayed with amended water. These areas shall be kept damp to reduce airborne asbestos concentrations.

(c) Loose and Hanging Asbestos Material. Loose or hanging ACM, PACM or asbestos material shall be removed in accordance with the requirements of Section 8.4 of this Subpart.

(d) Repair of Fireproofing and Thermal Insulation. After installation of hangers, brackets or other encasement/enclosure supports, and before installation of encasement/enclosure sheathing material, damaged areas of fireproofing and thermal insulation shall be repaired using a non-asbestos material as per Section 56-7.2 of this Part. Surfaces shall be prepared and replacement material applied in accordance with manufacturer's recommendation.

(e) Integrity of Installation. Encasements/enclosures shall be designed to be permanent and shall be constructed to provide an airtight barrier. The encasement/enclosure sheathing material shall be impact resistant and shall be installed with adequate supports, reinforced to withstand local environmental
conditions, casual contact and any internal pressures developed within the encasement/enclosure structure.

(f) Utility Maintenance. Utilities shall be lowered as necessary and reinstalled in a manner which allows proper utilization, and does not disturb the integrity of the encasements/enclosures. Utility maintenance shall not require the encasements/enclosures to be opened or disturbed.

(g) Ducts. Ducts insulated with ACM, PACM or asbestos material shall not be encased or enclosed.

(h) Air Plenums. ACM, PACM or asbestos material-insulated air plenums, which are not readily accessible for inspection, shall not be encased or enclosed.

(i) Marking or Labeling. Encased/enclosed asbestos material shall be conspicuously marked or labeled in order to warn persons of its presence.

(j) Cleanup. Waste cleanup shall be in accordance with Subpart 56-8.5.

(k) Final Cleaning and Clearance Air Sampling. Final cleaning and clearance air sampling shall be in accordance with Subpart 56-9.

5.15 Equipment and Waste Container Decontamination and Removal Procedures

(a) Timing of Waste Transfer Activities. During Phase II B of the project, after ACM, PACM, asbestos material and debris is bagged, wrapped, or containerized, waste transfer from the regulated abatement work area as per this Section, shall occur when no gross removal is taking place.

(b) First Cleaning. External surfaces of contaminated bags/containers and equipment shall be cleaned by wet wiping or HEPA-vacuuming or both in the regulated abatement work area before moving such items into the waste decontamination system washroom by persons assigned to this duty.

(1) Exception. Minor size regulated abatement work areas that do not have a contiguous washroom, are allowed to have all waste bag/container cleaning with additional containerization completed within that work area. The waste generated shall be immediately bagged /containerized within the regulated abatement work area. Once the abatement and cleaning is
complete within the regulated abatement work area, each waste bag/container shall be wet-wiped, placed in a second bag/container and sealed airtight (except for non-porous drums which shall be washed and dried only), labeled with the generator's name, location generated and other caution labels as per current EPA NESHAP regulation requirements,

then moved to the airlock. The waste bags/container shall then be transferred to the secured waste trailer/dumpster for disposal by appropriate legal method.

(c) Washroom Procedures. All bagged/containerized contaminated items and asbestos waste shall be passed into the washroom during waste transfer operations. Workers from uncontaminated areas in full protective clothing and appropriate respiratory protection shall enter the washroom and place the
appropriate supply of specified clean waste bags/containers within the washroom. One team of workers shall be stationed in the washroom for bag/container cleaning and additional containerization as necessary. The workers shall ensure all curtained doorways are closed during the waste container transfer procedure and that all bags/containers are sealed properly
before removing for transport and disposal.

(1) Additional Cleaning. Once in the waste decontamination system, external surfaces of the contaminated bags/containers and equipment shall be cleaned an additional time by wet cleaning in the washroom.

(2) Additional Containerizing. Once the additional cleaning is completed and the cleaned bags/containers of asbestos waste are dried of any excessive pooled or beaded liquid, they shall be placed in a clean uncontaminated plastic bag or wrapped in sheeting (except for non-porous drums which shall be washed and dried only), as the items physical characteristics demand, and sealed airtight. When the bags/containers are moved to the holding area, lockable trailer, or lockable hardtop dumpster, the bags/containers shall be appropriately labeled with the date they are moved from the waste decontamination system marked on the container in waterproof markings. Caution labels as per the requirements of current EPA NESHAP regulations, including the generator's name and location generated shall also be affixed at this time.

(3) Removal to Airlock or Small Project Clean Room. The equipment and cleaned/containerized waste shall be moved into the airlock, or for Small projects to the clean room, that leads from the washroom. The washroom workers shall not enter this airlock, Small project clean room or the regulated abatement work area until waste transfer is finished for that transfer period. Once waste transfer is complete, the washroom workers shall proceed to the regulated abatement work area and then to the personal decontamination system, or immediately to the remote personal decontamination system.

(d) Removal to Holding Area, Lockable Trailer Or Lockable Hard Top Dumpster.
Bags/containers and equipment shall be moved from the airlock and into the holding area, or directly from the holding area to the lockable trailer or lockable hardtop dumpster by persons attired in clean personal protective equipment who have entered from uncontaminated areas. Asbestos waste may
stay in the holding area no longer than one (1) week or in a lockable trailer or lockable hard top dumpster until filled, but in no instance longer than ten (10) calendar days after successful completion of Phase II C for all regulated abatement work areas at the site.

(e) Cart Usage and Cleaning. The cleaned containers of asbestos waste and equipment shall not be stored in the clean room but shall be placed in holding carts adjacent to but outside of the clean room, after passing through the decontamination unit. The carts may be used for temporary storage adjacent to the clean room until the end of the work shift.

(f) Holding Carts. The carts shall be watertight and have doors or tops that shall be closed and secured. The carts shall be HEPA-vacuumed and wet cleaned at least once a day.

(g) Trailers and Dumpsters. Waste transport trailers and dumpsters used to transport RACM waste, shall be hard topped, lockable and lined with two (2) layers of six (6) mil fire-retardant polyethylene. Prior to transport from the work site, all waste trailers and dumpsters shall be sealed to ensure air, dust and watertight integrity, utilizing six (6) mil plastic, duct tape and expandable foam sealant as necessary. The waste transporter is responsible for cleaning/decontamination of waste trailers or dumpsters, once the waste has been properly disposed of at the appropriately licensed and permitted landfill facility. Waste haulers (truck drivers) accessing the work area to remove waste trailers/dumpsters do not require certification as asbestos handlers. Waste hauler truck operators shall be allowed within the regulated work area for loading of waste and shall remain in their vehicle with the windows up and the ventilation system off while in the work area.

(h) Enclosure Security. The entrance to and exit from the waste decontamination system enclosure(s) shall be secured to prevent unauthorized entry. Signs as aper Section 5.01 of these Specifications shall be posted at the entrance to the decontamination units.

(i) Assigned Persons For Small Asbestos Projects. Where only one egress exists and the shower is used as a waste removal washroom, workers shall be stationed in each area/room of the decontamination system enclosure to transfer/process the contaminated bags/containers and equipment through adjacent areas/rooms as per this Section. These workers shall not cross into the
adjacent areas/rooms until waste transfer is finished for that transfer period and all other workers have decontaminated as per this Part. The clean room/holding area workers shall enter from uncontaminated areas attired in clean personal protective equipment. The clean room shall not be used as a holding area, but shall be used as a waste bag/container transfer area for loading waste bags/containers into carts, for immediate transfer to the waste transport trailer/dumpster.

5.16 FINAL CLEANING AND CLEARANCE PROCEDURES

1. Final Cleaning Procedures. The following cleanup procedures shall be required after completion of Phase II B activities:

(a) Continuous Negative Pressure Ventilation. If required during Phase IIB, the negative pressure ventilation units shall remain in continuous operation during implementation of Phase IIC, including observance of settling/waiting periods and drying times.

(b) First Cleaning, Lockdown Encapsulation and Top Layer Removal. All surfaces of the regulated abatement work area shall be first wet-cleaned using rags, mops and sponges. For collecting excess liquid and wet debris, a wet purpose HEPA filtered shop vacuum may be used and shall be emptied prior to removal from the regulated abatement work area. When the first cleaning has been completed, a thin coat of a lockdown encapsulant agent shall be applied to all surfaces within the regulated abatement work area which were not the subject of removal or abatement. In no event shall lockdown encapsulant be applied to any surface which was the subject of removal or other abatement response
activity, prior to obtaining satisfactory clearance air results for the regulated abatement work area. Once the lockdown encapsulant has been applied, and the appropriate waiting/settling or drying time requirements of this Subpart have been met, the cleaned, exposed top barrier layer of plastic sheeting shall then be removed from walls, ceilings and floors. Windows, doors, HVAC system

vents and other openings shall remain sealed. Decontamination system enclosures shall remain in place and shall continue to be utilized.

(c) Second Cleaning and Bottom Layer Removal. After the top layer of plastic sheeting has been removed, all objects and surfaces in the regulated abatement work area shall be HEPA-vacuumed and then wet-cleaned. After the second cleaning and waiting/settling or drying time requirements of this Subpart, then the remaining bottom layer of plastic sheeting on walls, ceilings and floors shall be
removed. All windows, doors, HVAC system vents and all other openings shall remain sealed.

(d) Third or Final Cleaning and Visual Inspection. After the bottom layer of plastic sheeting has been removed, all objects and surfaces in the regulated abatement work area shall be HEPA-vacuumed and then wet-cleaned. After the final cleaning is complete, clearance air sampling shall not commence until the appropriate waiting/settling or drying time requirements of this Subpart have elapsed and a visual inspection has been completed by the project monitor to confirm that the scope of abatement work for the asbestos project is complete, and no visible asbestos debris/residue, pools of liquid, or condensation remain. The asbestos abatement contractor supervisor must complete a satisfactory
visual inspection for completeness of abatement and cleaning, prior to commencement of the project monitor visual inspection.

(1) Project Monitor Visual Inspection. An appropriately trained and certified project monitor, contracted by the Owner, independent of the Contractor, shall complete the visual inspection. The project monitor visual inspection for completeness
of abatement and completeness of cleanup shall be performed as per the provisions of the current ASTM Standard E1368 "Standard Practice for Visual Inspection of Asbestos Abatement Projects". An entry shall be made into the Contractor supervisor's daily log by both the supervisor and the individual performing the inspection, detailing the findings of the visual inspection. The full name and NYSDOL asbestos handling certificate number of the certified individual performing the inspection shall also be documented in the supervisor's daily log.

(e) Exemption From Multiple Cleaning And Sheeting Removal. When the regulated abatement work area is not required to be plasticized, or when a tent enclosure unit is used, one thorough final cleaning followed by the observance of the appropriate waiting/settling or drying time requirement of this Specification shall be required. For regulated abatement work areas where one (1) layer of plastic sheeting is allowed, two (2) cleanings (first and final), each followed by observance of the appropriate waiting/settling or drying time requirements of this Subpart is required. Cleanings shall consist of all surfaces in the regulated abatement work area being HEPA vacuumed first and then wet-cleaned.

(f) Waiting/Settling And Drying Times Requirements. For sequential removals as per NYCRR Part 56, Section 56-8.6(b), the most stringent waiting/settling/drying time shall be observed.

(1) The following waiting and drying times per material abated shall be observed for each stage of cleaning as per this Subpart:

(i) fireproofing, plaster, TSI and other friable materials - 12 hours
(ii) abrasive removals of floor tile/mastic with machinery - 12 hours
(such as a bead blaster, grit blaster, etc.)
(iii) manual removal of floor tiles/mastic - 4 hours

(iv) manual abatement of interior non-friable materials - 4 hours
(v) Incidental disturbance asbestos project - 4 hours
(vi) tent with glovebag abatement of TSI - 2 hours
(vii) intact transite panel removals indoors - 2 hours
(viii) Exterior non-friable ACM abatement without negative pressure enclosure - None

(h) Decontamination of Tools & Equipment. All equipment (except negative air ventilation system) and tools shall be removed from the regulated abatement work area and properly decontaminated as per this Part, prior to commencement of clearance air sampling.

5.17 Final Clearance Air Monitoring

The contractor is hereby notified, unless otherwise instructed, final air monitoring clearance is performed on all Metro-North Railroad asbestos projects, regardless of size or scope of work.

a. Satisfactory Clearance Air Sample Results. The clearance air sample results shall be considered acceptable when the clearance criteria in NYCRR Part 56, Section 56-4.11 have been satisfied.

b. Unsatisfactory Clearance Air Sample Results. Required actions if the nonexempt regulated abatement work area clearance air sampling results are unsatisfactory are as follows:

(1) Recleaning.
If the results of inside work area group of air samples are unsatisfactory, recleaning of regulated abatement work area surfaces using wet methods is required, with the negative air pressure equipment operating as per the requirements of this Part. If only the results of the outside work area group of air samples are unsatisfactory, clean-up of surfaces outside of the regulated abatement work area using HEPAvacuums and wet-cleaning methods shall be performed.

(2) Collection of New Samples.
(i) If the results for the inside work area group of air samples are unsatisfactory, after recleaning of work area surfaces, clearance air sampling shall not commence until the appropriate waiting/settling or drying time requirement as per Section 56-9.2(f) has elapsed and no visible asbestos debris/residue, pools of liquid, or condensation remain, then collection and analysis of an additional full set (both inside and outside work area samples) of clearance air samples as required by Section 56-9.2(d) shall be completed.
Samples shall be placed in the same positions as before, and the new samples analyzed for concentrations of airborne fibers.

(ii) If only the results for the outside work area group of air samples are unsatisfactory, following clean-up of surfaces outside of the regulated abatement work area, collection and analysis of an additional group of outside work area clearance air samples as

required by Section 56-9.2(d) shall be completed. Samples shall be placed in the same positions as before, and the new samples analyzed for concentrations of airborne fibers.

c. Repeating Air Sampling and Analysis. The requirements of this Subdivision shall be repeated until satisfactory clearance air sampling results have been achieved, for all non-exempt regulated abatement work areas throughout the entire work site.

5.18 Dismantling of Regulated Abatement Work Area.

(a) Collapsing and Containerizing of Tent Enclosures. Each tent enclosure and airlock shall not be dismantled until clearance air sampling has been performed and satisfactory results obtained. The plastic sheeting which formed the tent, airlock, and the contents thereof, shall be fully collapsed, starting from the top and working downward. The tent and contents shall be placed in at least a six (6) mil plastic bag or hard wall container, sealed airtight with duct tape and removed for disposal. The plastic sheeting shall be treated as contaminated material and properly disposed of as asbestos waste.

(b) Removal of Tools and Equipment. All remaining tools and equipment shall be removed from the regulated abatement work area after proper decontamination as per this Part.

(c) Removal of Remaining Barriers. Once the Contractor receives satisfactory clearance air sample results, or an acceptable visual inspection for an exempt regulated abatement work area, and all tools and equipment are removed, all remaining polyethylene, duct tape, expandable foam and other barrier materials shall be bagged, wrapped or containerized and labeled as asbestos waste. Temporary hard wall barriers must be dismantled and removed from the site. If any debris/residue is observed behind barriers, it shall be removed and bagged/containerized followed by HEPA-vacuuming and wet cleaning of the surfaces that were hidden behind the barrier. All waste generated shall be removed to the holding area, lockable trailer or lockable hardtop dumpster. The Contractor's supervisor shall then conduct a final inspection of the regulated abatement work area to certify that the abatement work is complete and no debris/residue remains. The results of the final inspection for each regulated abatement work area shall be noted in the Contractor supervisor's daily project log.

(d) Removal of Decontamination Enclosure. After all other remaining isolation barriers, tools and equipment have been removed from the regulated abatement work area, the remaining decontamination enclosure for the regulated abatement work area must be dismantled and removed from the work site. All plastic sheeting shall be removed and disposed of as asbestos waste.

5.19 FINAL WASTE REMOVAL FROM SITE REQUIREMENTS

a. Asbestos contaminated waste is hauled only by Metro-North Railroad approved haulers to a landfill site previously approved by Metro-North Railroad. The Contractor shall contact the Metro-North Safety Department for a list of previously approved haulers and facilities. The Contractor may submit information regarding alternate haulers and landfill sites for approval by the Metro-North Railroad Safety Department prior to use.

b. Air Sampling Requirements.

i. Satisfactory Clearance Air Results. Satisfactory clearance air results must be obtained, for all non-exempt regulated abatement work areas, before final waste removal from the site may be completed as per this Subpart.

c. Removal of Tools and Equipment. All remaining tools and equipment shall be removed from the work site after proper decontamination.

d. Removal of Remote Decontamination Enclosures. After all regulated abatement work areas for the asbestos project have been dismantled as per NYCRR Part 56, Section 56-9.3, any remaining remote decontamination enclosures must be dismantled and removed from the work site. All plastic sheeting shall be removed and disposed of as asbestos waste.

e. Removal of Waste from the Site. All waste generated as part of the asbestos project shall be removed from the site within ten (10) calendar days after successful completion of Phase II C for all regulated abatement work areas at the site. All waste generated during the asbestos project shall be legally disposed of at an approved landfill facility as per 5.19 (d) of these Specifications.

f. All generated waste removed from the site must be documented, accounted for and disposed of in compliance with the requirements of EPA NESHAP. The Contractor shall note the number of bags at the end of each work shift in the log book, with a final tally at the end of the job. Bags must be labeled in accordance with regulatory requirements for asbestos and with the Contractor's name, location of abatement and dates of accumulation.

6.00 SPECIAL PROJECTS

Emergency Projects.
(a) Air Sampling and Analysis. Air sampling and analysis on emergency asbestos projects shall be conducted in accordance with the requirements of NYCRR Part 56, Subpart 56-4.

(b) Where Allowed. Permissible under this Section are only those projects that are deemed by the Commissioner or his or her duly authorized representative as being necessary to respond to an unexpected, unanticipated or unforeseen occurrence, including but not limited to, an incidental disturbance of ACM, PACM or asbestos material, a steam, chemical, gas or water line rupture, or boiler
failure or a building/structure collapse, which poses

(1) an imminent danger to the health and safety of the public or
(2) an asbestos related risk to the health and safety of the public from release of airborne asbestos fibers.

(c) Licensing and Certification. Emergency asbestos projects conducted under this Subpart shall comply with the requirements of NYCRR Part 56, Sections 56-3.1, 56-3.2 and 56-3.3 of this Part.

(d) Notification. Prior to the commencement of an emergency asbestos project, the Contractor shall comply with the emergency asbestos project notification requirements set forth in NYCRR Part 56, Sections 56-3.5 and 56-3.6 and Metro-North Railroad specifications.

(e) Approved Emergency Project. If permission to proceed as an emergency asbestos project is granted as per this Subdivision and Section 56-3.5, all work done on the project must be performed in a manner consistent with applicable provisions of this Part or with approved variance conditions required by the
Commissioner or his or her designee. If the asbestos project will be completed using alternative procedures defined within a site-specific variance, the approved variance decision must be obtained prior to proceeding with the asbestos project. If permission to proceed with the emergency asbestos project is denied, all work shall be performed in accordance with all applicable provisions of this Part.

(f) Corrective Actions for Incidental Disturbance of Asbestos Containing Materials:

(1) Upon discovery, the affected area shall be cordoned off with barrier tape at a distance of twenty-five (25) feet from the outer most limit of the disturbance. This shall be considered the regulated abatement work area for the cleanup of the disturbed materials. The regulated abatement work area shall be immediately cordoned off and adequate signage shall be
posted as described in NYCRR Part 56, Subpart 56-7.4. After evaluation and emergency notification for the incidental disturbance as per Section 3.5, the following applies:

(i) A minimum of a Small project decontamination system enclosure, which may be remote from the work area, shall be installed and utilized for the asbestos project. For interior regulated abatement work areas, critical barriers shall be installed as per Section 56- 7.11, or an appropriately sized tent enclosure shall be installed to serve as an isolation barrier, dependent upon the size and configuration of the area disturbed. Then negative air ventilation systems shall be established as per Section 56-7.8(a).

(ii) For outdoor regulated abatement work areas, all adjacent building openings within twenty-five (25) feet of the outermost limit of the disturbance shall be sealed with two (2) layers of six (6) mil fire retardant plastic sheeting.

(2) Tent enclosures, if necessary, shall be constructed as per Section 56-7.11(f)(1) to surround the area of disturbance. The tent shall be sealed to the surfaces beyond the limits of contamination, and those surfaces of the tent enclosure (wall, ceiling, or floor) shall not require plastic sheeting. An attached airlock is required.

(3) Due to the nature of this work, background air samples shall not be required.

(4) Wet methods shall be employed to minimize further disturbance of the affected material during cleanup activities. No removal of undisturbed ACM, PACM or asbestos material shall be allowed during the incidental disturbance cleanup emergency asbestos project.

(5) Visual Inspection. Once final cleaning is complete, a visual inspection shall be completed by the asbestos abatement contractor's supervisor to confirm that the scope of abatement work for the asbestos project is complete, and no visible debris/residue, pools of liquid, or condensation remain.

(6) Removal of Personal Protective Equipment. The worker's disposable protective clothing shall be removed and left in the incidental disturbance work area upon exiting.

(7) Exiting Procedures. After exiting the tent, workers shall immediately don clean protective clothing within the attached airlock. Workers shall then proceed immediately to a shower for decontamination.

(8) Final Cleaning and Clearance Procedures. Final clean-up procedures shall comply with Section 56-9, except that only one (1) stage of cleaning (final) is to be performed. Lockdown encapsulant use is not required except for porous contaminated surfaces subject to cleaning. After cleanup is complete, a visual inspection followed by the completion of clearance procedures, shall be performed consistent with the requirements of NYCRR Part 56 and Metro-North Railroad specification.

6.01 Minor Asbestos Projects.

(a) Air Sampling and Analysis. Air sampling and analysis on a Minor asbestos project conducted under this Section shall be conducted in accordance with the requirements of Subpart 56-4 of this Part.

(b) Where Allowed. For asbestos projects with abatement of less than or equal to ten (10) square feet or twenty-five (25) linear feet of ACM, PACM or asbestos material, Phase II Minor asbestos project abatement procedures as per this Section may be complied with in lieu of full compliance with Sections 56-7 through 56-9. All other requirements of this Part shall apply. Minor asbestos project corrective actions shall include limited enclosure, spot repair/patching, incidental disturbance clean-up, spot removal, and spot encapsulation. All corrective actions except spot

removal shall be performed using non-asbestos material. Repairs where spot removal has occurred shall also utilize nonasbestos
material. The regulated abatement work area shall be established as per the requirements of Section 56-7.4.

(c) Ventilation for Power Tools. Power tools used to drill, cut, or otherwise disturb asbestos material in Minor size regulated abatement work areas, shall be manufacturer equipped with HEPA-filtered local exhaust ventilation.

(d) Glovebag Use. Glovebag operations shall be performed within negative pressure tent enclosures, and shall utilize commercially available glovebags of at least six (6) mil, transparent plastic and no larger than needed. See Section 56- 7.11 regarding tent construction and Section 56-8.4 regarding proper glovebag procedures. For an isolated event necessary for repair associated with normal operations and maintenance activities, a single glovebag operation may be performed without a negative pressure tent enclosure.

(e) Tent Use. Tents may be used to perform Minor size asbestos abatement, with or without the use of glovebags. Commercially available tents with floors, walls and ceilings of at least one layer six (6) mil, fire-retardant plastic or a constructed tent per Section 56-7.11(f)(1) of this Part may be used. When utilizing a tent for Minor size asbestos projects, the following shall be required:

(1) Personal/Equipment Decontamination Room or Area. An existing room or area that is adjacent to the regulated abatement work area shall be used for the decontamination of personnel and equipment. The room or area shall be covered by an impermeable dropcloth on the floor or horizontal working surface. The room or area must be of sufficient size to
accommodate cleaning of equipment and removing personal protective equipment. Work clothing must be cleaned with a HEPA vacuum before it is removed. All equipment and surfaces of asbestos waste bags/containers must be cleaned prior to removing them from the
decontamination room or area. All personnel must enter and exit the regulated abatement work area through the decontamination room or area.

(2) Personal Protective Equipment. All persons shall don appropriate personal protective equipment before entering the tent in compliance with current OSHA regulations. Authorized visitors entering the tent shall also don NIOSH-approved respiratory protection.

(3) Exhausting the Tent. A HEPA-vacuum or other negative pressure HEPA-filtered ventilation equipment shall be used to continuously exhaust the tent in accordance with Sections 56-7.8(a) and NYCRR Part 56, 56-7.11(f)(1).

(4) Amended Water. All material to be removed shall be saturated with amended water as specified in NYCRR Part 56

(5) Abatement Procedures. Asbestos material shall be removed and sealed in plastic bags prior to removal from tent. Edges of asbestos material remaining shall be encapsulated or sealed with wettable cloth.

(6) Sealing of Surfaces and Edges. The substrate from which asbestos was removed and any exposed edges shall be sealed with encapsulant.

(7) Clean Up. Cleanup shall be accomplished as follows:

(i) Method. All accumulations of asbestos waste material shall be containerized and removed. HEPA-vacuums shall be used to clean all surfaces after gross cleanup.

(ii) Removal of Contaminated Equipment and Waste. Contaminated equipment and all containerized waste shall be removed from the regulated abatement work area.

(iii) Cleanup of Surfaces. All surfaces in the regulated abatement work area shall be wet-cleaned using rags, mops or sponges.

(iv) Waiting Period. Negative pressure HEPA-ventilated air equipment shall be operated for a minimum of twenty (20) minutes following completion of final wet cleaning.

(8) Visual Inspection. Once final cleaning is complete, a visual inspection shall be completed by the asbestos abatement contractor's supervisor to confirm that the scope of abatement work for the asbestos project is complete, and no visible debris/residue, pools of liquid, or condensation
remain.

(9) Removal of Personal Protective Equipment. The worker's disposable protective clothing shall be removed and left in the tent upon exiting.

(10) Exiting Procedures. After exiting the tent, workers shall immediately don clean protective clothing. Workers shall then seal the tent exit and, upon tent collapse, shut down the HEPA-vacuum.

(11) Collapsing and Containerizing the Tent. The plastic sheeting which formed the tent, and the contents thereof, shall be fully collapsed, starting from the top and working downward. The tent and contents shall be placed in at least a six (6) mil plastic bag or hardwall container, sealed
airtight with duct tape and removed for disposal.

(12) Showering. Workers shall proceed immediately to a shower for decontamination.

(13) Failure. Actions to be taken in the event of loss of tent integrity are detailed within NYCRR Part 56, Section 56-8.4(j).

6.02 Pre-Demolition Asbestos Abatement Projects.

The following Phase II abatement procedure modifications shall apply for building/structures planned for demolition. All ACM, PACM or asbestos material must be removed from a building/structure and the asbestos project completed, prior to commencement of demolition activities.

(a) Air Sampling and Analysis. Air sampling and analysis on asbestos projects conducted under this Section shall be conducted in accordance with the requirements of Subpart 56-4.

(b) Regulated Abatement Work Area Preparation. Regulated abatement work area preparation shall be as per Subpart 56-7, except as follows:

(1) Timing - Removal of Salvage. Objects that can be removed from the regulated abatement work area without disturbing friable ACM prior to beginning Phase II B abatement procedures shall be completed as follows. The removal of nonporous, movable or non-movable salvage
shall occur after critical barriers, isolation barriers and decontamination enclosures are in place in that portion of the building or structure, and only after salvage has been wet-cleaned and HEPA-vacuumed.

(2) Floor, Wall & Ceiling Plasticizing and Sealing. All porous floor, wall and ceiling surfaces, except where abatement of ACM, PACM or asbestos material shall be performed on those specific surfaces, shall be covered with one (1) layer of, at a minimum, six (6) mil fire-retardant plastic sheeting. The floor shall be plasticized first, and its plastic sheeting shall extend up the walls a distance of at least twelve (12) inches on all sides. The walls shall then be plasticized by applying plastic sheeting from the ceiling to the floor, overlapping the floor sheeting by at least twelve (12) inches. Next, the ceiling shall be plasticized, overlapping the walls by at
least twelve (12) inches, to form a secure airtight seam. If the floor surface is not to be plasticized, it shall be made watertight. All seams in the plastic shall be sealed watertight and airtight.
(3) Suspended Ceilings. Suspended ceiling tiles and T-grid components in proximity to friable ACM shall remain in place until the regulated abatement work area has been fully prepared in accordance with this Section, and electrical and HVAC systems have been shut down. These
potentially contaminated suspended ceiling components shall be removed at the completion of the remaining work area preparation, including establishment of negative air ventilation systems, prior to commencement of Phase II B activities. These removed ceiling components shall be bagged/containerized and disposed of as asbestos waste. Critical barriers shall be installed above the suspended ceiling as per NYCRR Part 56, Section 56-7.11(a), prior to the commencement of Phase IIB abatement.

(4) Elevators. Elevators running through the regulated abatement work area shall conform to the following:

(i) The elevator door in the regulated abatement work area shall be enclosed per NYCRR Part 56, Section 56-7.11(d).
(ii) Elevators not remaining in use shall have the fuses removed and the power switch locked in the open position.
(iii) Elevator shafts shall not be used as waste chutes for asbestos waste material.
(iv) Elevators that remain in use shall conform to the additional procedures to minimize the piston effects.

(a) Elevator controls shall be modified to bypass the regulated abatement work area.
(b) A third (final) layer of polyethylene is to be duct taped airtight but with slack so as to form a larger perimeter diaphragm. Air leakage across the barrier shall be corrected upon discovery, and the elevator shaft shall be checked for airborne asbestos contamination. If contamination is found in this area, the entire affected area shall be wet-cleaned prior to continuing any other work.
(c) This system shall be smoke tested daily.

(c) Removal. Removal of ACM, PACM and asbestos material shall proceed as per the requirements of NYCRR Part 56, Subpart 56-8.

(d) Final Cleaning and Clearance Procedures. Final clean-up and clearance procedures for pre-demolition abatement shall comply with NYCRR Part 56, Section 56-9, except that only two (2) stages of cleaning (first and final) are to performed. Lockdown encapsulant use shall be consistent with Section 9.1(b).

(e) Final Waste Removal From the Site. The requirements of Subpart 56-10 shall apply, once all asbestos project regulated abatement work areas have been completed.

6.03 Controlled Demolition with Asbestos in Place

(a) Air Sampling and Analysis. Air sampling and analysis on an asbestos project conducted under this Section shall be conducted in accordance with the requirements of NYCRR Part 56, Subpart 56-4.

(1) In addition to the requirement of Subpart 56-4.9(b-c), air monitoring within the work areas shall be conducted daily during abatement and cleaning activities. If more than one (1) shift daily is required to accomplish the work, air monitoring within the work area during abatement shall be performed on each shift, preferably at mid-shift timing.

(b) Asbestos to Remain During Demolition. A building/structure may be demolished with asbestos material in place, as per the requirements of this Section, when the following condition is met:

(1) Building/Structure is Condemned. A building or structure may be ruled structurally unsafe by a licensed Professional Engineer, Registered Architect, Building Inspector, Fire Inspector or other official of competent jurisdiction. The official shall attest to the condition of the building/structure in writing. A copy of the condemnation letter shall be attached to the project notification mailed to the Department of Labor and a copy shall be posted at the work site.

(c) Controlled Demolition Procedures. The following controlled demolition procedures shall be followed:

(1) Project Size. Unless the size of the project can be positively quantified it shall be deemed to be a Large project. The maximum fee shall accompany the notification.

(2) Regulated Abatement Work Area. The entire demolition area shall be considered the regulated abatement work area. This area shall be enclosed within a barrier to prevent unauthorized entry. Signage on this barrier shall be in accordance with Section 56-7.4. Orange construction fence or snow fence is acceptable for this purpose. For outdoor regulated
abatement work areas, all adjacent building openings within twenty-five (25) feet of the outermost limit of the disturbance shall be sealed with two (2) layers of six (6) mil fire retardant plastic sheeting, and the exterior asbestos project regulated abatement work area shall extend a minimum of twenty-five (25') feet from the outermost limit of the disturbance.

(3) Entrance or Exit. Entrance or exit of all persons and equipment shall be through one (1) designated and controlled "access way" in the barrier or fence, which shall provide a means of egress from the regulated abatement work area.

(4) Decontamination Areas. All decontamination areas shall be within the regulated abatement work area. An equipment decontamination area shall be cordoned off within the worksite for cleaning of heavy equipment, i.e., backhoes, excavators, loaders, etc. The ground surface in this decontamination area shall be banked on the sides to confine the contaminated wastewater.

(5) Equipment Decontamination. Equipment shall be decontaminated prior to exiting the regulated abatement work area, utilizing a pressure wash system, after which all exposed surfaces inside and out shall be wet wiped. The surface below the equipment shall be scraped or cleaned of any residual asbestos contamination. This material shall be removed and
disposed of as asbestos contaminated material.

(6) Wet Methods. No dry disturbance or removal of ACM, PACM or asbestos material shall be permitted.

(7) Debris. All debris generated by the demolition shall be considered to be asbestos contaminated waste (to be disposed of as RACM), except for structural members, steel components and similar non-suspect items which shall be fully decontaminated as per this Part.

(8) Wetted Demolition Waste. The demolition waste shall be wetted on a continuous basis, that is, prior to, during and subsequent to its actual collection and removal. Fog nozzles or similar type of equipment shall be used to perform the wetting.

(9) Wetted Piles of Waste. Piles of waste not actively being worked on, i.e. piles being added to or portions being removed or piles left over extended periods of time, shall be covered with at least one layer of six (6) mil polyethylene to retain its moisture level and to prevent fiber release.

(10) Wastewater. Wastewater shall be confined within the controlled demolition regulated abatement work area. All wastewater shall be collected by means of trenching or ditches and directed into a holding tank. Disposal of such wastewater shall be in accordance with applicable
laws and regulations. After wastewater has dissipated, the earth surface below the trenches and holding tank shall be scraped and any residual asbestos contamination removed and disposed of as asbestos contaminated waste.

(11) Pending Disposal. All demolition waste shall be placed in hard wall, closed containers or vehicles with at least two (2) layers of fire retardant six (6) mil plastic sheeting draped loosely over the sides of the load to facilitate being wrapped over the top of the load and sealed air tight prior to transport from the site. Dumpsters shall be considered to be hard wall containers. There shall be no visible emissions or water leakage from these containers.

(12) Contaminated Earth Surfaces. The earth surface below the rubble and or contamination areas shall be scraped clean of any residual asbestos contamination. This material shall be removed and disposed of as asbestos contaminated waste.

(13) Final Cleaning and Clearance Procedures. Final clean-up and clearance procedures for abatement shall comply with Section 56-9, except that only one stage of cleaning (final) is to be performed. Lockdown encapsulant use is not required.

(14) Final Waste Removal From the Site. The requirements of Subpart 56- 10 shall apply, after all asbestos project regulated abatement work areas have been satisfactorily cleared.

6.04 Exterior Project Removal of Non-friable ACM Roofing, Siding, Caulking, Glazing Compound, Transite, Tars, Sealers, Coatings, and Other NOB ACMs.

The following Phase II abatement procedures shall apply for exterior removal of non-friable asbestos-containing roofing, siding, caulking, glazing compound, transite, tars, sealers, coatings, and other NOB ACMs, currently in a non-friable intact condition, unless the ACM is rendered friable during removal or debris falls within the building/structure. The asbestos project shall then be completed in accordance with all requirements of this Part, except Special Projects, NYCRR Part 56, Subpart 56-11.

(a) Air Sampling and Analysis. Air sampling and analysis on asbestos projects conducted under this Section is required as per Metro-North Railroad specification. Air sampling and analysis shall then be conducted in accordance with the requirements of NYCRR Part 56, Subpart 56-4.

(b) Regulated Abatement Work Area Preparation.

(1) Establishment and Isolation of Regulated Abatement Work Area. The immediate work area shall be considered to be the area from which the asbestos containing materials are actively being removed. The asbestos project regulated abatement work area shall extend twenty-five (25') feet from the perimeter of the immediate work area and shall have signage in accordance with Section 56-7.4. An airlock shall be required at the entrance to the regulated abatement work area to serve as a changing area, if the workers shall have to pass through enclosed publicly occupied space, such as from a roof through an interior stairway, to access the
decontamination units.

(i) Where the asbestos project regulated abatement work area extends outward twenty-five (25) feet and extends downward one (1) floor to encompass a passage or vehicular door which must be used for either a primary entrance or by an emergency vehicle,
thereby precluding sealing such door, a tunnel structure (with sides and roof) built of plywood sheeting, covered with at least two (2) layers of at least six (6) mil plastic, shall extend outward twenty-five (25) feet horizontally from the line of vertical projection of the roof edge downward to grade level

(2) Preliminary Preparation. Regulated abatement work area preparation shall also comply with NYCRR Part 56, Sections 56-7.2, 7.3, 7.4, 7.5, 7.6, 7.7 and 7.9.

(3) Decontamination System Location. The personal and waste decontamination system enclosures can be remote but must be within fifty (50) feet of the building/structure entrance used by the asbestos handlers (workers), and shall be removed only after obtaining satisfactory clearance air results for the regulated abatement work area or an

acceptable visual inspection has determined that the abatement is complete, as per Section 56-9. 2(e).

(4) Critical Barriers. Prior to the placement of critical barriers, affected surfaces shall be pre-cleaned using HEPA-filtered vacuum equipment and wet cleaning methods. All openings within the regulated abatement work area shall be sealed with critical barriers installed as per NYCRR Part 56, Section 56- 7.11(a), prior to beginning Phase II B activity on the project. The critical barriers shall be removed only after satisfactory clearance air sampling results have been obtained or the asbestos project is complete. The requirements of Section 56-7.11(b-e) do not apply. Additional requirements are as follows:

Roofs:

(i) All openings (including operable windows, doors, ducts, grilles, communicating openings, etc.) one (1) story above and one (1) story below the roof level of the regulated abatement work area (this includes any building/structure within twenty-five (25) feet of the immediate work area), shall be sealed directly with two (2) layers of at least six (6) mil flame-retardant plastic sheeting. All vent openings which cannot be sealed shall be extended vertically a minimum of eight (8) feet and remain in operation.

(ii) A polyethylene drape or curtain may be used instead of plasticizing the windows individually. The drape may be removed after the asbestos project is complete.

(iii) The drape or curtain, if used, shall be made of two (2) layers of a continuous eighteen (18) foot curtain (drape) of at least six (6) mil plastic hung from the top of the wall or parapet. The plastic curtain shall be secured using nailer strips and ram set charges or other methods approved by the building/structure owner's authorized
representative. The bottom of the plastic curtain shall be sufficiently weighted or anchored to prevent lifting due to winds. Curtain seams shall overlap at least twelve (12) inches and be sealed with duct tape front and back. The curtain ends and each
seal shall be reinforced by stapling furring strips to the plastic. The plastic curtain shall extend a minimum of fifteen (15) feet beyond the last opening within twenty-five (25) feet of the regulated abatement work area. When removed, the plastic curtain shall be
disposed of as asbestos waste.

(iv) Any windows on the floor below or above and within twenty-five (25) feet of the immediate work area need to be plasticized, but if safety reasons dictate, they may be plasticized from inside the building/structure.

(v) Any fixed or non-operable windows on the floor below or above and within twenty-five (25) feet of the immediate work area need not to be plasticized, but shall be sealed using caulking or duct tape.

Facades:

(vi) Removals without tents will require plasticizing or sealing of nearby windows within twenty-five (25) feet of the immediate work area, placement of dropcloths, plasticizing of a man-lift or scaffolding and other operational safeguards as outlined below.

(vii) For larger work area removals, any operable windows or openings to the building at the work level or on the floor below within twenty-five (25) feet of

the immediate work area shall be plasticized with two (2) layers of six (6) mil fire retardant polyethylene sheeting. The windows can be plasticized outdoors, or for reasons of safety,
from the indoors. Window, door and louver units subject to complete removal must have their openings plasticized at the interior of the building. Windows that are fixed or non-operable and that will remain sealed airtight for the duration of abatement activities, do not require installation of critical barriers.
(viii) Under areas where non-friable materials are removed without tents, a dropcloth, made of six (6) mil fire retardant polyethylene sheeting, shall be placed on the ground below the work area to prevent spread of any ACM remnants. This dropcloth shall be a minimum of ten (10) feet wide with an additional ten (10) feet of width for every floor above a 1st floor level where removal work will take place, up to a maximum of thirty (30) feet of width measured perpendicular to the building/structure. In addition, if a straight scaffolding, man-lift, swing scaffolding or similar equipment is used for areas above the 1st floor, the lift/scaffolding unit shall be plasticized with two (2) layers of six (6) mil fire retardant polyethylene on the platform, with plastic sheeting extended
vertically to waist-high (as so equipped) guardrail sides and back of the lift unit. While the platform/lift walking surfaces must be plasticized, the asbestos abatement contractor must provide proper traction surfaces or equipment to assure the safety and comfort of abatement workers while performing abatement activities on the lift/scaffold equipment. After non-friable ACM is removed from each work location, the platform and plasticized surfaces toward the building shall be wet wiped and/or HEPA vacuumed clean before reuse. The plasticizing on the lift or scaffolding shall be periodically inspected during use and repaired as needed.

(c) Removal. Removal of ACM shall utilize manual wet methods for all non-friable ACM removals, and rotating blade roof cutters for roofing removals, as applicable. In no event shall methods be used that may render the ACM friable.

(1) Residual non-friable ACM shall be wet scraped and HEPA vacuumed. Materials removed shall be containerized or immediately wrapped in two (2) layers of six (6) mil fire retardant plastic sheeting and secured air tight prior to transport to the waste decontamination facility.

(2) Under façade areas where non-friable ACM is to be removed without tents, whenever possible, an asbestos handler (worker) with a HEPA vacuum will position the vacuum hose within four (4) inches of the material being removed to capture small pieces of non-friable ACM and asbestos fines. The hose end will be positioned so that as many smaller pieces of
material as possible will fall into the vacuum hose end. Larger pieces of ACM should be immediately bagged or containerized.

(3) Asbestos containing materials will not be allowed to accumulate in the work area or on the drop cloth.

(4) In lieu of using an exterior chute as per Section 8.4(g), waste bags and containers may be lowered to the waste trailer/dumpster by crane or hoist using a temporary waste transfer container of adequate size and strength.

(d) Clean-Up Procedures During Abatement. The following clean-up procedures shall be performed during abatement.

(1) Visible accumulations of loose asbestos containing waste material shall be cleaned up using rubber or plastic dustpans and rubber squeegees or HEPA filtered vacuums. Metal shovels may also be used, except in the vicinity of plastic sheeting, critical barriers and isolation barriers, which could be perforated by these tools. To pick up excess water and gross wet debris, a wet-dry HEPA filtered shop vacuum dedicated to asbestos abatement may be used. This cleaning shall be done whenever there is sufficient asbestos waste material to fill a single leak-tight bag/container, or this cleaning shall be done at the end of each work shift whichever shall
occur first. Visible debris shall be maintained adequately wet.

(2) Work shall stop whenever excessive water accumulation or flooding is present in the area and shall not resume until the water is collected and disposed of properly.

(e) Final Cleaning and Clearance Procedures. Final clean-up and clearance procedures for abatement shall comply with NYCRR Part 56, Section 56-9, except that only one (1) stage of cleaning (final) is to be performed. Lockdown encapsulant use is not required.

(1) Exemption from Project Monitor Visual Inspection. Asbestos projects which are exempt from clearance air sampling requirements at one or two family owner occupied residential buildings/structures, are also allowed an exemption from the project monitor visual inspection requirements. For asbestos projects utilizing this exemption, once final cleaning is complete,
a visual inspection shall be completed by the asbestos abatement contractor's supervisor to confirm that the scope of abatement work for the asbestos project is complete, and no visible debris/residue, pools of liquid, or condensation remain. The results of this inspection shall be
documented by the asbestos abatement contractor's supervisor in the asbestos abatement contractor daily project log, and once the asbestos project is complete the asbestos abatement contractor's supervisor shall also obtain the owner's written acceptance of the final results of the
asbestos project within the daily project log.

(f) Final Waste Removal From the Site. The requirements of Subpart 56-10 shall apply, once all asbestos project regulated abatement work areas have been completed.

6.05 Non-friable Flooring and/or Mastic Removal

The following Phase II abatement procedures shall apply for removal of non-friable asbestos-containing flooring and/or mastic materials including cove base and associated mastic. (Note - Full work area preparation, attached decontamination system enclosures, abatement and multiple cleanings per this Part are required for beadblaster use or other abrasive abatement method.)

(a) Air Sampling and Analysis. Air sampling and analysis on an asbestos project conducted under this Section shall be conducted in accordance with the requirements of NYCRR Part 56, Subpart 56-4.

(b) Regulated Abatement Work Area Preparation.

(1) Establishment of Regulated Abatement Work Areas. Each regulated abatement work area shall be established and signage posted as per the requirements of NYCRR Part 56, Section 56-7.4. Each regulated abatement work area shall remain vacated except for certified workers until satisfactory clearance air sampling results have been obtained or the asbestos project

is complete.

(2) Preliminary Preparation. Regulated abatement work area preparation shall also comply with NYCRR Part 56, Sections 56-7.1 through Section 7.10, except that six (6) air changes per hour are required within the work area.

(3) Critical and Isolation Barriers. Prior to the placement of critical and isolation barriers, affected surfaces shall be pre-cleaned using HEPA filtered vacuum equipment and wet cleaning methods. All critical and isolation barriers shall be installed as per NYCRR Part 56, Section 56-7.11(a-b) and all seams of HVAC or other system components that pass through a regulated abatement work area shall be sealed prior to beginning Phase II B work for each regulated abatement work area on the project. The critical and isolation barriers shall be removed only after satisfactory clearance air sampling results have been obtained.

(4) Removal of Mounted Objects and Elevator Isolation. Regulated abatement work area preparation shall also comply with NYCRR Part 56, Section 7.11(c-d).

(5) Plasticizing. The ceiling, walls and floor need not be plasticized as per Section 56-7.11(e) for manual or chemical removal methods.

(c) Removal. Removal of ACM and asbestos material shall proceed as per the requirements of Subpart 56-8.

(d) Final Cleaning and Clearance Procedures. Final clean-up and clearance procedures for abatement shall comply with Subpart 56-9, except that only one (1) stage of cleaning (final) is to be performed. Lockdown encapsulant use shall be consistent with Section 9.1(b), with the exception that lockdown encapsulant shall only be applied to non-removal surfaces covered with fire-retardant plastic
sheeting.

(e) Final Waste Removal From the Site. The requirements of Subpart 56-10 shall apply, once all asbestos project regulated abatement work areas have been completed.

6.06 Abandoned Pipe/Duct/Conduit Wrap and Cut Removal.

The following Phase II abatement procedures shall apply for wrap and cut removal of asbestos containing or ACM covered abandoned pipes/ducts/conduits. All other requirements of this Part shall apply:

(a) Air Sampling and Analysis. Air sampling and analysis on an asbestos project conducted under this Section shall be conducted in accordance with the requirements of Subpart 56-4 of this Part.

(b) Regulated Abatement Work Area Preparation.

(1) Establishment of Regulated Abatement Work Areas. Each regulated abatement work area shall be established and signage posted as per the requirements of Section 56-7.4. Each regulated abatement work area shall remain vacated except for certified workers until satisfactory clearance air sampling results have been obtained or the asbestos project is complete.

(2) Preliminary Preparation. Regulated abatement work area preparation shall also comply with Section 56-7.1 through Section 7.11(d).

(i) Exception. For exterior regulated abatement work areas with ACM, PACM or asbestos material intact, establishment of negative air systems as per Section 56-7.8, and installation of isolation barriers as per Section 7.11(b) is not required. Remote
decontamination system enclosures are allowed for exterior regulated abatement work areas.

(3) Critical Barriers. Prior to the placement of critical barriers, affected surfaces shall be pre-cleaned using HEPA-filtered vacuum equipment and wet cleaning methods. All critical barriers shall be installed as per Section 56-7.11(a) and all seams of HVAC or other system components that pass through a regulated abatement work area shall be sealed prior to beginning Phase II B work for each regulated abatement work area on the project. The critical and isolation barriers shall be removed only after satisfactory clearance air sampling results have been obtained.

(4) Limitations. Full regulated abatement work area negative pressure enclosure preparation as per Section 56-7.11(a, b and e) is not required if the following removal conditions are followed:

(i) The ACM, PACM or asbestos material must be intact, and the wetted pipe/duct/conduit shall be wrapped in two (2) independent layers of at least six (6) mil fire-retardant plastic sheeting and sealed airtight.
(ii) A one-layer dropcloth of at least six (6) mil fire-retardant plastic sheeting shall be utilized below the ACM, PACM or asbestos material during all wrapping operations.
(iii) Insulation removals to allow for cuts of pipe/duct/conduit and cuts for removal of ACM pipe/duct/conduit or sections thereof shall be performed using glovebag procedures within a negative pressurized tent enclosure, per Section 56-8.4(a).

(c) Removal. Removal of the wrapped ACM and asbestos material shall proceed as per the requirements of Subpart 56-8.

(d) Final Cleaning and Clearance Procedures. Final clean-up and clearance procedures for abatement shall comply with Subpart 56-9, except that only one stage of cleaning (final) is to be performed. Lockdown encapsulant use is not required, except as indicated for glovebag procedures.

(e) Final Waste Removal From the Site. The requirements of Subpart 56-10 shall apply, after all asbestos project regulated abatement work areas have been completed.

7.00 SUBMITTALS

7.01 General

a. The Contractor shall provide all submittals required by the specifications to the Owner or their designated representative. The Contractor shall revise and resubmit all submittals as required by the Owner or as necessary to comply with the specifications. The term "Submittals" shall mean all written plans, written information, documentation, drawings, samples, certifications, photographs, tests and other information requested by the Owner or required by the specifications.

b. The Contractor shall provide the requested Submittals to the Owner for review by the Owner, the Engineer, the Environmental Monitor and any other agency or party deemed a necessary recipient by the Owner. The Contractor is hereby notified that they may be disqualified from the work based upon their failure to provide submittals required by this specification or other information requested by the Owner.

c. Acceptance of submittals by The Owner shall not relieve The Contractor from any responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this specification.

d. The Contractor shall provide The Owner all required and any additionally requested submittals no later than twenty (20) days after the award of the contract, or by the date mutually agreed upon by The Owner and The Contractor.

e. All equipment and materials to be used for the performance of the work must be submitted for The Owner's review and approval prior to use. This shall include, at a minimum, material safety data sheets (MSDS), technical data sheets, specification sheets, material/equipment cut sheets, samples of materials, and design drawings with enough detail to satisfy The Owner.

f. The Contractor shall provide technical data sheets and instructions for the use of all materials, products and equipment proposed for the project, even if the requirement for the data sheets and instructions is not specifically stated in other sections of this specification. The Contractor shall maintain the data sheets and instructions at the project site.

g. The Contractor shall only mobilize equipment, materials, products, etc. that have been submitted for use and reviewed by the Engineer. The Contractor will be prohibited from using equipment, materials, products, that differ from those that were submitted for review prior to project mobilization.

h. A minimum of ten (10) working days is required for The Owner's review and response on all submittals, drawings and calculations. The submittals required hereunder shall demonstrate compliance with all applicable requirements under this Contract. Written approval of the required plans from the Owner is mandatory prior to the start of any work on site. After the Owner has approved each submittal, the Contractor shall comply with the terms thereof.

i. The Owner may refuse acceptance of Contractor's submissions lacking the appropriate specificity.

j. The following is a summary of submittals to be provided by the Contractor to the Owner for review. The Owner reserves the right to request additional submittals from The Contractor as deemed necessary. Submittals shall include, but not be limited to, the following:

1. Applications, Notifications, Permits, Variances, Agency approvals, etc.
2. Evidence of Prior Experience Conducting Similar Work
3. Qualifications of Personnel Including Licenses, Respirator Fit Tests, Medical Clearance Exams
4. List and Qualifications of Subcontractors to be utilized
5. Quality Assurance & Quality Control Plan
6. Site Specific Health & Safety Plan
7. Hazard Communication Program
8. Emergency Response Plan (ERP) & Contingency Plan
9. Respiratory Protection Program
10. Corporate Health & Safety Plan
11. Design Drawings / Engineered Drawings Approved by a Licensed Professional Engineer
12. Temporary Construction Plan
13. Material Safety Data Sheets
14. Catalogue Cut Sheets, Product & Technical Data Sheets
15. Material & Product Samples
16. Work Schedule & Progress Reports
17. Cost Estimate, if applicable
18. Project Photographs
19. Site Specific Work Plan
20. Containment Plan
21. Waste Storage Plan

7.02 Coordination of Submittals

a. Prior to each submittal, the Contractor shall carefully review and coordinate all aspects of each item being submitted and verify that each item and the submittal for it conforms in all respects with the requirements of the specifications. The Contractor shall sign each submittal to certify that such has been performed.

b. All submissions shall be accompanied by a letter of transmittal clearly identifying the contents of the submittal with site-specific reference to the project. Each letter of submittal shall be consecutively numbered.

7.03 Submittal Schedule

a. The Contractor shall provide The Owner all required and any additionally requested submittals no later than twenty (20) days after the award of the contract, or by the date mutually agreed upon by the Owner and the Contractor. Submittals shall be received a minimum of fifteen (15) days prior to the start of work. Work shall not be allowed to commence until the Submittals have been reviewed and approved by The Owner. The Contractor is solely responsible for all costs incurred by the Contractor arising from delay of the work due to the Contractor's inability to provide the required Submittals.

b. The Contractor shall provide all submittals far enough in advance of scheduled project dates to provide all time required for reviews, for possible revisions and resubmission, and for placing orders and securing delivery, as applicable.

c. The Owner shall be allowed ten (10) working days to review submittals upon receipt of the submittal. The Contractor shall allow for additional time for potential resubmissions.

7.04 Review of Submittals

a. The Owner will review submittals for general conformance with the project requirements and regulatory compliance. This review by the Owner shall not relieve the Contractor of the responsibility for full compliance with contract, specification or regulatory requirements for abatement operations.

b. The Contractor shall not construe approval of Contractor submittals to imply approval of any particular method or sequence for conducting the work, or for addressing health and safety. Approval of the programs by the Owner does not relieve the Contractor of the responsibility to conduct the work in strict accordance with all applicable law or the requirements of this specification, or to adequately protect the health and safety of all workers involved in the project, including any members of the public who may be affected by the project.

c. The Contractor remains solely responsible for the adequacy and completeness of the design drawings, plans, programs, and work practices, and adherence to them.

d. Submittals reviewed by The Owner will be marked with one of the following designations:

1. No Exceptions Taken
2. Exceptions As Noted
3. Revise and Resubmit
4. Rejected.

e. The Contractor shall not proceed work until such submittals have been designated by the Owner as "No Exceptions Taken" or “Exceptions As Noted”, unless specifically authorized to do so by the Owner.

7.05 Submittals Requiring Resubmission

a. If corrections to submittals are required, returned copies will be marked “Revise and Resubmit”, or “Rejected”, and the required corrections shall be made on the submittal copies. One (1) copy will be returned to the Contractor.

b. Resubmissions will be handled in the same manner as first submissions.

c. The Contractor shall promptly notify the Owner, if any correction indicated on submittals constitutes a change of the requirements. .

d. When a submittal has been designated as “No Exceptions Taken” or “Exceptions As Noted” by the Owner, construction shall be carried out in accordance therewith and no further changes made therein except upon written instructions from the Owner.

e. The Contractor assumes responsibility for, and shall bear all costs that may result from the ordering of any material or from proceeding with any part of the work prior to being accepted.

7.06 Drawings

a. The Contractor shall prepare accurate and complete shop drawings covering all parts of the work where shop drawings are required by the site specific specifications, project requirements or as directed by the Owner. The Contractor shall bear all costs or damages resulting from the ordering of any material prior to the acceptance of the shop drawings.

b. Shop drawings shall be completely checked by the Contractor, and his/her Subcontractor responsible for preparation of the drawings, prior to submission to the Owner. The Contractor's signature on the shop drawings shall attest to the Contractor's checking of the drawings. Failure by the Contractor to attest to the checking of the shop drawings as required herein will be cause for the shop drawings to be returned to the Contractor without review by the Owner.

c. Design drawings shall be submitted as required by the site-specific project specifications. At a minimum, shop drawings shall be prepared on 11" x 17" white paper.

d. The title block for all shop drawings shall be identical for all trades and shall bear the number and title of the drawing, Contract number, date of drawing revision, clear identification of contents, references to the Contract documents, location of work, with graphic scales and grid marks, the names of the Vendor and/or subcontractor and the Contractor and the Contractor's Approval Stamp.

e. Drawings that do not meet The Owner's format requirements will be rejected and returned for resubmission. Rejection of drawings is not considered cause for delay in completion of the work.

f. The shop drawings shall be arranged in a systematic order and numbered consecutively in the lower right hand corner.

g. Shop and working drawings shall be accurately prepared to a scale sufficiently large to show all pertinent aspects of the depicted items.

h. The Contractor shall submit a minimum of three (3) prints of each shop drawing to the Owner for review. Should review of drawings by others in addition to the Owner be required, the number of copies of such drawings to be submitted shall be increased as directed by the Owner. The Owner will indicate corrections to the drawings as necessary to secure completion of the work in accordance with the site-specific project requirements. In case of correction or rejection, the Contractor shall resubmit the drawings until they are acceptable to the Owner.

i. Where a submission involves engineering computations, or original design work is depicted, the submission shall show the name, the New York State registration number and the seal of the Professional Engineer certifying such computations or design work. All shop drawings involving design by The Contractor shall be signed and sealed by a New York State licensed Professional Engineer and signed by The Contractor prior to being submitted.

j. Detailed working drawings shall be submitted for temporary structures, containment, and for other temporary work as may be required for construction but which does not become an integral

part of the completed project. Submissions shall include back-up calculations or any information needed to explain the structure or system or its intended use.

k. If the drawings show variations from the requirements of the specifications, the Contractor shall indicate on the drawings and describe such variation in the letter of transmittal. If the Contractor fails to indicate and describe such variations, the Contractor shall not be relieved of the responsibility for executing the work in accordance with the specifications.

7.07 Samples

a. The Contractor shall submit samples of materials, products or equipment as requested by the Owner. Submissions of samples shall be made as soon as practicable, and unless otherwise indicated, shall consist of not less than two (2) identical samples of each type required. If required, The Contractor shall prepay all return shipping charges for samples submitted to The Owner. The Contractor shall not utilize materials, products, equipment, etc. for which samples are required until approved by The Owner.

b Each sample shall be labeled to indicate:

1. Description of the Project and Contract Number
2. Name of Contractor and/or Subcontractor
3. A description of the material, product, or equipment represented
4. The name of the supplier or a source of the product
5. Name of the manufacturer or producer
6. A description of how and where the product will be utilized on the project

c. The Contractor shall provide, under separate cover, a letter of transmittal for the submittal of each shipment of samples. The information listed above shall be included on the letter of transmittal. A letter of transmittal shall be enclosed with each shipment of samples.

7.08 Work Schedule & Progress Reports

a. The Contractor shall submit a detailed work schedule for the project. The Contractor shall submit a schedule consistent with the site-specific project requirements to the Owner for approval. The schedule shall be consistent with the Contractor's proposed Work Plan; a cost estimate, plan and schedule to complete the work as specified. The schedule shall illustrate estimated completion dates of project milestones. The schedule shall be revised and updated as requested by the Owner during the course of the work. Anticipated changes to the cost or time estimates shall be brought to the Owner's attention immediately. The Contractor shall revise estimates of cost and/or time with written justification fro changes

7.09 Product Approval

a. Products are reviewed and approved for use by the Owner based upon product performance and occupational health and safety concerns. The Contractor shall review MTA Metro-North Railroad's Approved Products List when determining products suitable for a particular application that have already been reviewed and approved for use.

b. Prior to usage of a product that contains or generates regulated or hazardous constituents and is not listed on MTA Metro-North Railroad's Approved Products List, the Contractor shall submit information on the particular product to the Owner for review and approval for use on the

Owner's property. The Contractor shall submit product data sheets, Material Safety Data Sheets, and any and all pertinent product information for all products to be utilized on the project to the Owner for review prior to use. Examples of such products may include, but not be limited to: encapsulate, detergents, expansion foam, masonry fillers, sealants, compounds, putties, caulking materials, etc.

c. Only upon approval from the Owner, shall the Contractor utilize the product. The Contractor shall utilize products in accordance with the manufacturer's specifications and recommendations, and health and safety requirements applicable to their use.

8.0 Site Specific Submittals

a. General - The Contractor shall provide the following submittals and other information for review and approval prior to performing any work under this specification. As described within this section, the Contractor shall submit certain plans and information prior to the start of work and in conformance with 7.03 of these specifications. The following is a list of site specific submittals due from the Contractor prior to the start of work in the field:

Health & Safety Plan
Employee licenses, fit tests and medical clearance to wear respirators,
Cost Estimate
Schedule
Work Plan
MSDS, Cut Sheets, Manufacturer Sheets

8.01 Project Photographs

a. The Contractor shall photograph pre-project existing conditions, the surface preparation test areas, various stages of completion throughout the project, and final conditions upon project completion.

b. The Contractor shall provide the Owner with preconstruction and post construction color photos. The photographs shall be color prints from standard 35 mm film and approximately 4" x 6" in size. The Contractor shall provide two (2) prints of each exposure. The Contractor shall include a written log and plan plotting the photos taken for all photos submitted.

c. Preconstruction photographs shall be taken and submitted to The Owner to show all existing conditions The preconstruction photos shall be taken prior to the start of work or project mobilization. The preconstruction photos shall be submitted to the Owner no later than ten (10) calendar days from the date they were taken or prior to project close out, whichever comes first.

d. Upon completion of the work and after the work area has been restored, The Contractor shall take post construction photos. The post construction photos shall be taken at or as near to the original location and camera angle as the preconstruction photos as possible.

e. Upon completion of the work, the Contractor shall provide two (2) photo albums to The Owner, one (1) with the preconstruction photos and one (1) with the post construction photos. One (1) additional copy of each preconstruction and post construction photo and the negatives for the photos shall accompany the photo album submission. The photo album design shall allow for the preconstruction and post construction photos to be displayed side-by-side, or as approved by The Owner.

f. All photos, including copies, shall have the following information printed with indelible ink on the rear of the photo or a label directly below the photo.

- The Owner
- Contract Number
- Site Description
- Project Description
- Roll Number and Photo Number (corresponding to the number on the negative)
- Date and Time the picture was taken

- A general description of what the photograph represents, including the view depicted and camera angle
- Indicate whether the photo is a preconstruction, construction in progress, or post construction photograph
- Name of photographer

g. At the direction of the Owner, the Contractor shall provide additional preconstruction or post construction photos and/or photos of damages resulting from his/her operations.

8.02 Site Specific Work Plan

a. The Contractor shall submit a detailed site specific Work Plan outlining the means, methods, procedures, equipment and materials to be utilized to execute the project as specified. The work plan should detail how the Contractor plans to complete the work in a detailed step-by-step format. The Work Plan shall include a description of all project related activities, from commencement through completion, providing the sequence of work attached to a work schedule or timeline estimating the anticipated duration of each task.

b. The Contractor shall submit a list of any proposed subcontractors and include their specialty and qualifications including any required licenses and or permits. Subcontractors are bound by the plans submitted by the Contractor and approved by the Owner. Subcontractors may be required to provide submittals separate from those provided by the Contractor. The Owner reserves the right to refuse Subcontractors based upon lack of qualifications or inability to provide requested submittals.

c. The Work Plan shall also include, but not be limited to, the following information:

1. A brief summary of the scope of work to be completed,

2. A description and plans of any required rigging or scaffolding,

3. A description of temporary construction, including temporary services or utilities and erection and/or placement of temporary facilities such as construction trailers, storage containers, decontamination facilities and sanitary facilities,

4. Methods of storage/securing of materials, tools, equipment,

5. Any applications, notifications, permits, licensing, variance requests or approvals necessary to complete the work,

6. Material & Safety Data Sheets for all products to be used during performance of the work,

7. A summary of specific methodologies, procedures, schedules to be employed to complete the work,

8. Cost estimate and schedule,

9. A detailed listing of all equipment, tools, materials, and products proposed for use during the project, along with manufacturer's product data sheets, catalogue cut sheets, Material Safety Data Sheets, specifications, other pertinent information or specific information

requested by The Owner shall be included. The manufacturer's name, specific model or product identification number, and a description of the product's function or specific use shall be provided. The submittals for materials, tools and equipment shall include and not be limited to:

Electrical and water service, lighting within containment, site lighting, portable heaters containment materials, adhesives, fasteners, tapes, sealants, scaffolding, airless paint sprayers and associated equipment, personal protective equipment, protective work clothing, disposable coveralls, respiratory protection, eye, hearing, head, hand, and foot protection, hand tools, power tools, HEPA vacuums, decontamination facilities, wastewater filtration systems, pumps, and filters, waste containers, and any other product to be utilized on the project as requested by the Owner, the Engineer, and the Environmental Monitor.

10. Engineered drawings approved by a New York State licensed Professional Engineer, if applicable.

8.03 Emergency Response Plan and Contingency Plan

a. Prior to commencement of on site work, the Contractor shall submit to the Owner an Emergency Response Plan (ERP) and Contingency Plan which detail the procedures that will be followed in the event of an accident, emergency situation, release or spill.

b. The Contractor shall provide the contingency plan for the notification, clean up, and reporting that will be undertaken in the event of a spill or releases that may impact the public or the environment.

c. The following elements shall be included in the ERP and Contingency Plan:

1. Emergency Phone/Contact List
2. Site Description and Evaluation
3. Pre-Emergency Planning
4. Personnel Roles and Lines of Authority
5. Emergency Recognition and Prevention
6. Safe Distances and Places of Refuge
7. Evacuation Routes and Procedures
8. Spill and/or Release Cleanup Procedures
9. Decontamination of Victims
10. Emergency Medical Equipment and First Aid
11. Emergency Alerting and Response Procedures
12. Critiques of Response and Follow-Up
13. Personal Protective Equipment
14. Emergency Equipment
15. Coordination of Emergency Services with Local Hospitals, Fire Department and other emergency service agencies
16. Maps, written directions to the nearest hospitals with phone numbers.

8.04 MSDS / Cut Sheets / Technical Data Sheets

a. The Contractor shall submit Material Safety Data Sheets (MSDS) for all products and materials proposed for use during performance of the work. Material Safety Data Sheets for all products to be utilized shall be maintained on site at all times during the project.

b. Catalogue Cut Sheets, Product & Technical Data Sheets - The Contractor shall provide manufacturer catalogue cut sheets, product data sheets, technical data sheets, and instructions and recommendation for the use, for all materials and equipment proposed for use on the project. The Contractor shall maintain the data sheets and instructions at the project site.

8.05 Temporary Construction Plan

a. The Contractor may be required to provide drawings for temporary construction. Such drawings shall include design calculations, live and dead loads, weight of stored materials, weight and operational data of the proposed construction equipment to be supported on the existing structures, and supporting data in sufficient detail to permit a structural review of The Contractor's proposed design of temporary work. The drawings and design calculations for temporary construction shall be prepared and signed and stamped by a Professional Engineer licensed to practice in the State of New York. The drawings shall be submitted sufficiently in advance of proposed use to allow for their review, revision, if required, and approval, without delay to the work.

b. The Contractor shall not start the construction of any temporary work for which working drawings are required until the working drawings have been reviewed by the Owner. Such review will not relieve the Contractor of responsibility for results obtained by use of working drawings.

c. All drawings shall contain an itemized materials list, with conformance to materials standards, manufacturer's trade names, as applicable, with current model or code numbers of their products.

8.06 Health & Safety Plan / Quality Assurance & Quality Control Plan

a. The Contractor shall provide a Quality Assurance and Quality Control Program in accordance with the requirements of the Owner’s Quality Assurance Program.

b. The Contractor shall demonstrate the ability to supply the labor, supervision, materials, equipment, insurance and expertise required to perform the specified work.

c. the Contractor shall disclose any legal or administrative action or proceeding brought by the United Stated Environmental Protection Agency (USEPA), the New York State Department of Environmental Conservation (NYSDEC), the New York City Department of Environmental Protection (NYCDEP), the United States Occupational Safety and Health Administration (OSHA), or other Federal, State or local agency having jurisdiction over environmental responsibilities or functions of safety and health.

e. If the entity has been the subject of legal proceedings, lawsuits, claims or citations levied by any Federal, State, or local governmental agency for any past or present abatement activities, a description of actions must be submitted, in conjunction with the resolution of the allegations and present status.

f. The Site Specific Health & Safety Plan (HASP) shall, at a minimum, address the following:

1.The Contractor's policy concerning employee health and safety,
2. A description of how the policy applies to the project. If a generic plan is submitted, site - specific information must be included so that the plan reflects site conditions and the scope of work.
3. Contractor's responsibility to maintain employee health and safety and enforce health and safety procedures.
4. Responsibilities for site control, management, supervision, and enforcement of health and safety procedures. The Contractor shall designate an individual who will be responsible for employee health and safety and has the background and authority to know what constitutes safe practices to direct implementation at the site.
5. The Contractors procedures for the protection of his/her employees, and employees of the Owner, the Engineer, and the Owner's representatives.
6. The Contractor's policy and procedures for environmental protection including, prevention of air, water, and soil contamination.

7. A description of any special provisions made for safety and health procedures for specific work requirements including items such as scaffolding, trenching, fall protection, cranes, maintenance and protection of traffic, confined space entry.
8. Guidelines on maintaining and revising the health and safety plan as needed to reflect site conditions and procedures and reassessing, re-evaluating the plan on a set schedule or as needed to maintain accuracy and applicability to the work.
9. Statement regarding the review, revision, and approval of the plan by the Contractor's American Board of Industrial Hygiene Certified Industrial Hygienist (CIH).
10. General requirements for emergency planning and contingency plans. Provide a project specific contact list and emergency phone numbers.
11. Directions, maps and addresses of nearby hospitals, fire departments, police departments, etc.
12. Reference to the Contractor's other written programs including the Respiratory Protection Plan and Personal Protective Equipment (PPE) Programs including selection and usage specifications, Hazardous Communication Program, Corporate Health & Safety Compliance Program
13. Statement of conformance and methods of conformance to the plan by The Contractor, his subcontractors, and site visitors,
14. Methods of on site communication, the lines of communication, and establishment of an emergency contact list,
15. General requirements and the definition of the Work Zone and methods of limiting unauthorized access,
16. A description of the provisions that will be made for first aid and emergency medical assistance, including equipment available at site, its accessibility for use by all, and a procedure for replacement of expended First Aid materials,
17. Statement concerning treatment of an injured worker with regards to emergency decontamination,
18. Procedures for reporting accidents, injuries, and incidents,
19. A description of the site-specific medical surveillance program,
20. EPA's recommended "Levels of Protection" including descriptions and usage requirements,
21. Industrial Hygiene practices including employee Right-To-Know and usage and availability of MSDS,
22. Personal exposure monitoring procedures, including a description of the tasks to be monitored, equipment, calibration and usage requirements,
23. The Contractor's plan for providing sanitary facilities and clean, potable drinking water,

24. Procedures for employee hygiene and decontamination,
25. Usage of personal protective equipment including eye protection, hearing protection, hard hats, safety shoes, respirators, protective clothing, harnesses, fall protection, fall arrest, gloves, safety belts,
26. Safe electrical procedures, including adequate lighting of work areas, maintenance of temporary circuits, use of insulated tools, ground fault interruption (GFI), lockout/tagout procedures.
27. Documentation of experience, training and certifications of The Contractor's employees, including personnel responsible for overseeing and enforcing on site safety and health procedures, the competent person, the industrial hygienist, and the American Board of Industrial Hygiene (ABIH) certified industrial hygienist,
28. Description of The Contractor's plan for regularly scheduled safety meetings and other periodic training to ensure safe work practices, including OSHA required annual refresher training,
29. Documentation of completion of training for all persons working on site as stipulated in Title12 NYCRR Part 56,
30. A description of housekeeping procedures,
31. A description of emergency egress and fire escape routes, and that such shall be clearly identified and not be blocked or locked,
32. A description of means implemented for fire protection and prevention including providing fire extinguishers at the site, having scheduled fire drills, and training,
33. Safe working practices for hot and cold environments.

8.07 Respiratory Protection Program

a. The Contractor shall submit a Respiratory Protection Program in accordance with 29 CFR 1926.103, 29 CFR 1910.134. Included as attachments to the formal Respiratory Protection Plan shall be Physician/Medical Approval to Wear a Respirator certificates and Respirator Fit Tests for all employees involved in the work for the Owner. Submitted medical approvals and fit tests shall be current and updated as necessary. It is the responsibility of the Contractor to provide the Owner with current, updated submittals throughout the term of the contract or period of work.

b. The Contractor's formal written respiratory program shall include a complete listing of respirator types, fit testing procedures for passive air filtering type respirators; and a matrix chart identifying tasks to be performed and the anticipated appropriate respirators for those tasks.

c Within this program The Contractor shall, at a minimum provide the following elements:

1. Standard operating procedures governing the selection and the use of respirators,
2. A respirator selection table detailing the respirator selection procedure based upon the hazard to which the worker will be or may be exposed,
3. Employee instruction and training for the use of respirators including their limitations,
4. Respirator cleaning and maintenance procedures,
5. Respirator storage procedures,
6. Respirator inspection procedures,
7. Individual assignment procedures,
8. Provisions for surveillance of conditions within the work area, the degree or extent of exposure, and/or stress imposed on workers,
9. Procedures for the regular inspection of the Respiratory Protection Program to maintain its applicability to site conditions and evaluation of the program's overall effectiveness,
10. Medical examinations determining workers' ability to wear a respirator,

11. Respirator fit tests

8.08 Hazardous Communication Program

The Contractor shall submit a Hazardous Communications Program in accordance with 29 CFR 1926.59. The Contractor shall specifically note the hazards inherent to the project work site and provide discussion regarding how the hazards will be communicated to the contractor's work force and authorized visitors.

8.09 Project Close-Out Submittals

A. Upon completion of the work, the Contractor shall submit the following information to the Owner. The Owner shall receive such information before the final payment for the work will be released to the Contractor.

1. All filings, permits, variances, approvals, granted to the Contractor by authorities or agencies to complete the work,
2. A complete copy of the Contractor's daily job log and the Supervisor's log including minutes from tool box/safety meetings, waste accumulation log, and incidents and accident reports.
3. All personal exposure monitoring data, including laboratory analytical data, compiled throughout the project,
4. All time sheets for workers and supervisors for all shifts and maintenance activities between shifts,
5. Licenses, fit tests and medical clearance to wear respirators for each member of the crew including supervision.

9.00 Pre-Bid, Pre-Construction & Project Meetings

A. The Owner will schedule project meetings throughout the course of the work. Upon award of the contract, the Contractor must attend all project meetings.

B. The Owner will schedule an initial pre-construction project meeting prior to the start of any work. The pre-construction meeting will address the conduct of the job, the lines of communication, and other pertinent information. The Owner will notify all involved parties of the time and place of the meeting. The Contractor must attend all pre-construction meetings.

C. Additional project or contract progress meetings may be held at intervals predetermined and mutually agreed upon by the Contractor and the Owner. Project meetings will facilitate project coordination with the Owner operations, coordination of the work with involved parties, establish a working relationship among the Contractor and other involved parties, allow for the review and update on the progress of the work, review changes or alterations to the original work scope, facilitate completion of the work in a timely fashion, and resolve any outstanding problems. The Contractor must attend the project meetings.

D. At the discretion of the Owner, the Owner or a designated representative of the Owner may record minutes of meetings. Meeting minutes shall be prepared and distributed to all parties present and to those designated for distribution.

E. Additional meetings may be scheduled by the Owner to discuss and resolve specific issues. The Contractor and Subcontractor(s), as requested by the Owner, are required to attend the additional meetings.

10.00 Protection of Underground Utilities

A. The Contractor is required by law to notify the One-Call Center for any subsurface work to be performed that may disrupt below grade and/or buried utilities. The Contractor shall notify the appropriate call center prior to conducting the work. It is the responsibility of the Contractor to contact the appropriate call center having jurisdiction over the locale in which the work is being conducted. The Contractor shall provide the notification in accordance with the specific requirements of the call center notification procedures and copy the Metro-North Safety Department on any such notifications.

B. The Contractor shall notify the Owner of the following:

1. The receipt acknowledging notification provided by the One-Call Center.
2. The response received from each of the underground utilities.
3. The on-site activities of the utilities' representatives including the demarcation of utilities.

C. The Contractor shall cooperate with the underground utilities' representative(s) as necessary to complete the work without damaging the utilities. Damages resulting from the Contractor's failure to comply with the instructions of the Owner or utility owner shall be repaired at the Contractor's expense.

11.00 Contractor's Plant & Temporary Facilities

11.01 General

A. The Contractor shall maintain and make readily available on site all project related documents, including but not limited to licenses, specifications, plans, MSDS, submittals and permits for inspection by the Owner, regulatory agencies, and other officials that may inspect the work unannounced at any time. The Contractor shall accommodate agency officials in the inspection of the work, during reasonable times, to ensure that it is in compliance with all applicable laws and regulations. The Contractor shall immediately notify the Owner of any regulatory authority visitors on site at the time of, and during the visit. The Contractor shall record the name, title and regulator agency the visitor is from.

11.02 Communication

A. The Contractor shall supply and maintain methods of wireless / radio communication between support personnel, workers inside containment, including supervisory personnel and the Owner, the Engineer, and the Environmental Monitor.

B. The Contractor shall ensure complete communication between the Owner and the Owner's representatives and site supervisory personnel. The Contractor's work crew shall be able to comprehend direction and instructions provided by the Owner and the Owner's representatives. The Contractor's supervision must communicate fluently in the primary language of the crew and the Owner or Owner's representative.

11.03 Housekeeping

The project site shall be kept as neat, clean, and organized, as the work will allow and shall be kept free of debris and rubbish. Equipment, tools and materials shall be stored neatly and orderly when not in use. Decontaminated, small equipment and materials shall be stored within a securable enclosure during all non-work periods. Contractor facilities shall be kept clean and free of obstruction at all times.

11.04 Contractor Use of Property Not Owned By The Owner

A. Unless otherwise directed by the Owner, it is the responsibility of the Contractor to obtain permission for the use of any property that is not owned solely by the Owner. The Contractor shall obtain all necessary permits and permission required for the use of any property not owned and operated by MTA Metro-North Railroad. This shall include, but not be limited to, private property, property owned by the State of New York, City of New York, counties, local municipalities, cities, villages, towns, and other agencies.

B. The Contractor is responsible for obtaining any permits or permission required to use property owned by others and paying all costs incurred for the use of such property. The Contractor shall obtain any applicable permits, easements or permission for property usage, the right to access/passage, the parking of vehicles, the disruption of the natural environment or work occurring above the property. The Contractor is responsible for the payment of any fees attached to permits, lease agreements or rental agreements.

C. Damage to property as a result of the Contractor's actions shall be corrected and repaired to the satisfaction of the property owner, solely at the Contractor's expense. The property owner or the Owner shall incur no costs for remediation.

11.05 Parking of Vehicles & Usage of The Owner's Property

A. The Contractor must request the prior approval of the Owner to use parking areas. Parking will be limited to vehicles necessary to the work. Unless otherwise directed by the Owner, there will be no available parking for personal vehicles on the Owner's property. The Contractor shall arrange for the parking for all other vehicles.

B. The Contractor is prohibited from parking private vehicles, trailers, trucks, etc. on tThe Owner's property for periods extending beyond the work shift without the prior approval of The Owner. The Contractor shall be responsible for off-site parking as required.

C. Commercial vehicles or construction equipment necessary for the execution of the work shall be limited to areas in which work is actively being conducted and shall be removed upon completion of the work to the satisfaction of The Owner.

D. Vehicles belonging to the Contractor, Subcontractors, and/or employees shall have identification cards and decals when used on the Owner's property or when parked in the Contractor's work/storage areas. The Owner will approve the means of identification. Vehicles not exhibiting the proper identification will be subject to towing and/or ticketing.

11.06 Ground Covers & Protection

A. The Contractor shall provide ground protection covering all surfaces on which contaminants, such as fuel or oil may be deposited as a result of the work. Ground surfaces shall be covered with impermeable materials that are capable of capturing any potential contaminant, solid or liquid that may be accidentally released during the work. Ground protection shall be provided under all stationary equipment to be utilized during performance of the work, under the waste holding area, under any products stored on site that may accidentally spill or leak from containers, and any other areas designated by the Owner or the Environmental Monitor. Ground protection shall extend beyond the location of the potential release, seams shall overlap a minimum of three (3) feet, and perimeters shall be bermed. The Contractor shall maintain on site an adequate supply of sorbent materials in the event of an accidental spill of liquid product, on site.

11.07 Temporary Facilities & Utilities

A. It will be the responsibility of The Contractor to provide sufficient electrical and water service, and sanitary facilities, at sites not having existing services.

B. It is the responsibility of The Contractor to coordinate connection of temporary services with the Owner and/or appropriate utility company. As requested, the Contractor shall provide all equipment necessary to complete the connection of temporary services to existing services.

C. The Contractor shall provide and maintain, all temporary services and utilities, including all labor, materials, equipment necessary to provide and maintain such services at all times as required for completion of the work as specified.

D. Temporary work shall generally include, but not be limited to the following: temporary light and power, temporary heat, temporary toilets, temporary water, hoisting systems, garbage bins, storage, temporary fences, temporary enclosures required to conduct the work in a proper manner.

11.08 Water Service

A. The Contractor shall provide temporary potable water service required for the work should a source of potable water not be readily available at the project site. The temporary water supply shall be suitable for all decontamination requirements, and all other areas of work requiring a water supply in order to complete the work as specified.

B. Upon the approval of the Owner, the Contractor may utilize existing water supplies presently on site.

C. The Contractor shall assume all costs for furnishing a temporary water supply, the quantity of water required to perform the work, and the collection of wastewater.

11.09 Toilet & Sanitary Facilities

A. The Contractor shall not utilize the Owner's toilet or sanitary facilities without the prior approval of the Owner. Toilets shall be maintained in conformance with the Housekeeping Section of these specifications.

B. The Contractor shall provide temporary sanitary and toilet facilities, sufficient in number for use by all persons involved in the project. Temporary toilets and sanitation facilities shall be kept clean and free of rubbish and odor. The location of such facilities shall be determined by the Contractor and approved by the Owner.

C. Portable toilets shall be delivered to approved locations, relocated if directed, and removed from the site by the rental company when required.

11.10 Fire Prevention

A. The Contractor shall take all possible precautions for the prevention of fires.

B. The Contractor shall prevent the unnecessary accumulation of flammable wastes and general garbage and refuse at the site. Garbage shall be removed at regularly scheduled intervals as to prevent a fire hazard.

C. The Contractor shall maintain temporary fire protection equipment on each work site. This equipment shall include but not be limited to multipurpose dry chemical portable fire extinguishers, having an extinguishing rating of at least 4A:40BC. Sufficient extinguishers shall be made available throughout the work site.

D. Temporary fire protection equipment shall meet or exceed local state and national requirements and standards. Fire protection equipment shall be compatible with equipment, solvents, and

chemicals maintained on site. Temporary fire protection equipment shall be readily accessible at all times, conspicuously located, maintained in operating condition, and inspected at required intervals.

E. A Fire Watch, employed directly by the Owner, may be required for work on the Owner's property.

F. The Contractor shall comply with the safety provisions of the National Fire Protection Association's "National Fire Codes" pertaining to the specific work.

G. The Contractor shall immediately notify the Owner or Owner's representatives of any fire observed at the site. This notification shall be made by the fastest possible means.

12.00 Scaffolding, Work Platforms and Protective Shielding and Netting

12.01 General

A. As applicable, the Contractor shall design, provide and maintain scaffolding, work platforms and protective shields and netting as required to access and complete the work. The Contractor shall furnish all labor, materials, tools and equipment necessary for the construction, erection, maintenance, removal and disposal of required scaffolding, work platforms and protective shielding and netting. Scaffolding, work platforms and protective shielding and netting shall meet OSHA standards and comply with the New York State Department of Labor laws.

B. Scaffolding, work platforms and protective shields and netting shall be of adequate size, design, and construction; having physical properties capable of providing proper functioning as required by its intended use. Scaffolding, work platforms and protective shielding and netting materials shall be constructed of fire retardant materials and secured, braced and tied to ensure the safety of those using and/or being protected by such equipment.

C. The Contractor shall submit design drawings, calculations, product data sheets and catalog cuts bearing the signature and seal of a Professional Engineer for required scaffolding, work platforms and protective shields and netting to the Owner for review. The Contractor shall submit the names and addresses of any Subcontractors, equipment manufacturers, and vendors and suppliers to be utilized in the work. Erection, installation and use of scaffolding, work platforms and protective shields and netting is prohibited until the required submittals are reviewed and approved by the Owner.

D. For the duration of the project, the Owner shall have the right to reject or condemn any scaffolding, protective shielding and netting that, in his opinion, is unsafe, improper or inadequate. Whether or not the Owner exercises this right, the Contractor shall not be relieved from his sole responsibility for the safe, proper, and lawful construction, maintenance and use of such scaffolding, protective shielding and netting, or for the adequacy of such scaffolding, protective shielding and netting. At the locations where the scaffolding, protective shielding or netting is found to be not acceptable, work at these locations shall cease until corrective measures acceptable to the Owner are completed.

13.00 Environmental Protection

13.01 General

A. The Contractor shall maintain and make readily available on site all project related documents, including but not limited to project notifications, variances, licenses, specifications, plans, submittals, permits, MSDS, etc. for inspection by the Owner, regulatory agencies, and other officials who may inspect the work. The Contractor shall accommodate government officials in the inspection of the work, during reasonable times, to ensure that it is in compliance with all applicable laws and regulations.

B. The Contractor shall comply with all applicable federal, state, city, and local laws, regulations, and ordinances pertaining to environmental protection, including all applicable New York State Department of Environmental Conservation (NYSDEC) and New York City Department of Environmental Protection (NYCDEP) requirements.

C. It is The Contractor's responsibility to become familiar with the specific requirements of environmental protection laws, regulations, and ordinances even though such may not be specifically referenced herein. It is the responsibility of The Contractor to ensure that its Subcontractors, Vendors, Suppliers, and the like comply with such requirements as well.

D. The Contractor shall be responsible for executing the work in a manner that prevents releases of environmentally degrading substances into the environment. In the event of a release of any substance, the Contractor is required to take immediate action to contain the release and notify the Metro-North Safety Department.

13.02 Noise Abatement

A. The Contractor shall comply with the requirements of OSHA regulations for occupational noise exposure and local ordinances applicable to the work.

B. The Contractor shall comply with the requirements of the New York City Noise Code for work within the limits of the municipality where the work is being performed. Should the operations require work be performed during hours other than the hours specified by the local municipality, the Contractor is responsible for obtaining the necessary variances from the Noise Control Code from the local municipal authority.

C. Depending on the location of the work within the Owner's territory and the time of work, a noise waiver permit may be required. It is the responsibility of the Contractor to determine if a noise permit is required in the locale the work is to be performed. If a noise permit is required to complete the work, a copy of the accepted formal application for the noise permit shall be provided to the Owner two weeks prior to commencing any field operations governed by the noise permit.

D. The Contractor shall ensure all equipment powered by an internal combustion engine is equipped with a functioning, properly maintained muffler. Malfunctioning muffler systems shall be immediately repaired and replaced as necessary.

E. Construction equipment noise at facilities occupied by the Owner's employees shall be maintained within acceptable levels set forth in OSHA regulations.

14.00 Health & Safety Requirement
14.01 General

A. The Contractor shall be solely responsible for the occupational health and safety of his/her employees. The Contractor shall conduct all work utilizing methods and procedures as to protect the health and safety of employees involved in the work, the surrounding community, the public, and prevent environmental degradation. The Contractor must attend Metro-North's Roadway Worker Safety Orientation for Contract Employees Working on Metro-North Property at no cost to Metro-North Railroad.

B. All work shall be performed in strict accordance with the standards of safety specific to the work being performed, and all applicable local, state, and federal regulations. The Contractor shall be responsible for compliance with the most stringent provisions of the applicable statutes and regulations of the City and State of New York, and the United States, including without limitation, the provisions of the United States Department of Labor-Occupational Safety and Health Administration (OSHA) and the New York State Department of Labor (NYS DOL). For the duration of the project, The Contractor shall adhere to the applicable federal, state and local laws and regulations pertaining to employee health and safety and the protection of the environment. The Contractor shall ensure regulatory requirements are observed and further that the methods of performing the work do not involve undue danger to employees, the Owner's representatives and inspection personnel, the public, and public or private property. Should charges of violation of any of the above be issued to the Contractor during the course of the work, a copy of each charge and resolution thereof, shall be immediately forwarded to the Owner.

C. In accordance with OSHA and New York State Labor Law, the Contractor shall be responsible for compliance with applicable laws, codes, rules, regulations and standards with respect to safety and health. The Contractor shall inspect and report compliance with all safety and health regulations in accordance with the approved Contractor's Safety Plan, and that requirements regarding safety and health are being fully implemented. The Contractor shall provide the project with the adequate safeguards, including but not limited to personal protective equipment, safe rigging, safety nets, fencing, barricades, scaffolding, and ladders, that are necessary for the protection of its employees, as well as the public and the Owner's representatives. All rigging and scaffolding must be of sound materials, of adequate dimensions and capacities for its intended use, and substantially braced, tied or secured to insure absolute safety for those required to use it, as well as those within its vicinity. All riggings, scaffolding and ladders shall be OSHA approved and protected from asbestos intrusion.

D. The Contractor shall issue and implement a Health & Safety Plan for the work. A detailed Health & Safety Plan shall be submitted to the Owner for review within thirty (30) days from the award of the contract.

E. The Contractor shall provide a minimum of three (3) copies of the Material Safety Data Sheets (MSDS) for materials and products to be utilized during the work. MSDSs must be sent to The Owner with the anticipated quantity of the material or product to be used, method of application, and location and method of storage. All MSDSs shall be submitted and fully approved by the Owner, prior to the start of work involving the usage of the particular substances on the project.

F. All products and materials used in connection with this project shall not contain asbestos in any concentration.

G. The Contractor shall immediately notify the Owner if during the course of the project there should be a discovery of any undetermined substances, including additional asbestos containing materials (ACM). Notification shall be in the form and content as required by NYCRR Part 56-3. No work shall be performed in any area having undetermined constituents or substances without the prior authorization of the Owner.

H. If any emergency condition should develop during the project, the Contractor shall immediately notify the Metro-North Railroad Safety Department of each and every occurrence. The Contractor may be required to make recommendations for appropriate courses of action.

I. Any review, acceptance, or approval of the Contractor's Health & Safety Plan shall be construed merely to mean that the Owner is unaware of any reasons at the time to object thereto. Approval by the Owner of the Contractor's Safety Plan shall not impose any liability upon the Owner, and/or the Owner representative, nor shall any such approval relieve the Contractor of any responsibilities under the contract.

J. The Owner, or representatives of the Owner, have the right to stop the Contractor's work in the event the health and safety or well being of the Contractor's employees, representatives of The Owner, inspection and/or management personnel, the public, the surrounding community, or the environment may be in jeopardy.

14.02 Required Qualified Personnel

A. The Contractor shall submit the name, experience, and qualifications of the Competent Person, and the individual certified in Cardio-Pulmonary Resuscitation (CPR) who will be assigned to the project. Prior to using any of the aforementioned individuals to perform any of the work under this specification, the Contractor shall submit an executed Statement of Qualification for the Competent Person to the Owner for review and approval.

B. The Contractor shall provide an individual that is trained and retains current certification to provide Cardio-Pulmonary Resuscitation (CPR). This individual shall be present on site throughout all phases of the work.

C. Competent Person

1. The Contractor shall provide a Competent Person who shall be responsible to perform the duties required by OSHA regulation. The Competent Person shall be present on site during all activities having the potential to result in employee exposure to asbestos fiber. The designated Competent Person shall be responsible for examination of equipment and evaluation of technical measures of worker protection. Other responsibilities shall include, but are not limited to the following:

    a. Maintain a permanently bound daily entry job log, signed by all individuals who enter and leave the site. The log shall record the Contractor, the specific work area, name and signature of the person, the Owner's contract number and the type of respiratory protection utilized by the worker. The daily entry logbook shall be available for inspection by the Owner throughout the project.

    b. A project inspection log shall be kept recording daily events, work progress and unusual events during the course of the work. This log shall remain accessible on-site and be made available to the Owner upon request.

D. Certified Industrial Hygienist

1. The Contractor may be required to retain the services of a Certified Industrial Hygienist (CIH) holding current certification by the American Board of Industrial Hygiene (ABIH) with at least one year of experience on asbestos operations. The Certified Industrial Hygienist shall be involved in the preparation of all health and safety related submittals and shall review and approve such submittals prior to submission to the Owner.

14.03 Accidents & Injuries

A. The Contractor shall provide such equipment and facilities as necessary or required in case of accident and/or personal injury, for first aid service to anyone who may be injured during the progress of work, within the limits of and for the duration of the work. In addition, the Contractor shall have written procedures for the decontamination, removal and hospital treatment of any person who may be injured or who may become ill.

B. The Contractor must report immediately to the Owner, any accident and/or personal injury resulting in lost time to employees, or any accident resulting in damage to the Owner's property or the public, and shall furnish in writing full information including testimony of witnesses regarding any and all, accidents and injuries.

14.04 Employee Protection

A. On Site Safety Meetings

The Contractor is responsible for holding on-site "tool box" meetings as necessary throughout the project as the work crew or work processes change throughout the course of the project. Prior to the start of work and as conditions change throughout the day, the Contractor shall conduct a job safety briefing instructing all workers in all aspects of personal protection, work procedures, emergency procedures, and use of equipment, including any procedures unique to this project The project supervisor / competent person shall be familiar with the Material Safety Data Sheets (MSDS) and personal protective equipment required for the individual tasks to be performed and the products to be utilized. Contractor employees shall be informed as to the products they are using and the personal protective equipment required for each of the tasks being performed. The Contractor shall maintain and make readily available at the job site MSDS for all products to be utilized during performance of the work. The Contractor's Site Supervisor shall strictly enforce compliance with health and safety procedures.

B. Work Site Illumination

Work area(s) shall be equipped with adequate temporary GFCI protected lighting. Connections must be made by the Owners' forces and arrangements shall be made in advance sufficient to accommodate the Owner's forces schedule. A minimum of ten (10) foot-candles of illumination shall be maintained throughout the work site during all working hours in accordance with all applicable federal, state and city laws, codes, rules and regulations including without limitation OSHA Regulations and Standards (1926.56 Illumination). The Contractor shall install auxiliary lighting as necessary. The Contractor shall supply one (1) portable light meter having the appropriate scale to verify conformance with these requirements. Lighting shall be adequately maintained and repaired as necessary to maintain the minimum specified light intensity.

C. Ladders & Scaffolding

1. Ladders, scaffolding, mobile lifts, and other access equipment shall meet all applicable OSHA requirements. Where ladders or scaffolds are used on a project to allow all work surfaces to be easily and safely reached for removal and cleaning, care shall be taken to prevent breaching of the containment areas. Scaffold joints and ladder openings shall be sealed with duct tape to prevent incursion of asbestos. During Phase II of the asbestos project, the asbestos abatement contractor shall make available, to authorized visitors, ladders or scaffolds of sufficient dimension and quantity so that all work surfaces can be easily and safely reached.

2. Scaffolding utilized for completion of the specified work shall be erected and maintained in compliance with 29 CFR 1926 Subpart L. In addition, scaffold design shall meet the requirements of the Owner. The Contractor shall submit scaffold design drawings to the Owner for review prior to commencement of the work. Only upon the Owner's approval, shall the Contractor commence scaffold erection.

D. Protection From Falling Objects

The Contractor shall implement a means of protecting areas below high work from falling tools, materials, equipment, debris. At the direction of the Owner, the Contractor may utilize the establishment of exclusion zones, installation of shielding, netting, or other approved forms of physical barriers to protect other workers, the public from falling objects and debris as per Section 12.00 of these Specifications.

E. Fall Protection

Fall protection systems shall be installed and maintained as required during performance of the work. Fall protection shall comply with 29 CFR 1926 Subpart M. Manufacturer cut sheets shall be provided for review by the Owner prior to installation.

F. Housekeeping

1. The Contractor shall maintain the project site as clean, neat, orderly, and as aesthetically pleasing as the work will allow. The project site, work zone, staging area, active work area, and other areas impacted by the work shall be kept free of debris and rubbish.

2. The Contractor shall remove any and all debris and rubbish from project site, staging area, or other areas impacted by the work, even if debris was not generated by the Contractor during the course of the work.

3. Entry and egress points, walkways, emergency access or exits shall be kept clean and free of obstructions and tripping hazards at all times. Temporary facilities shall be maintained clean and free of rubbish.

4. Equipment, tools, and materials and shall be stored neatly in appropriate storage locations when not in use within the asbestos containment.

5. Non-contaminated flammable, volatile, and combustible waste materials shall be collected, and properly packaged, labeled and stored for disposal on a daily basis.

6. The contractor shall provided a number of toilets as required for the total number of personnel working on site. Sanitary facilities shall be kept clean and free of rubbish and odor. Such facilities shall not create a health hazard or nuisance to the Contractor's employees, the Owner, the Owner's representatives, or adjoining properties. The Contractor shall ensure that the supplier stocks, cleans and maintains the facilities at regular intervals as recommended to maintain sanitary conditions.

7. The designated eating facilities shall be kept clean and free of food wastes and paper.

8. The Contractor shall clean the decontamination facility and containment entryway airlock daily.

9. The decontamination facilities shall be kept clean, sanitary, and free of excess water. The Clean Room and locker facilities within shall be kept clean and dry.

10. The decontamination facility shall be cleaned utilizing a commercially available bathroom sanitizer cleanser. An adequate supply of soaps, shampoos, and disposable body towels shall be maintained within the facility throughout the work.

END OF SECTION

SECTION 02 84 30 - UNIVERSAL WASTE AND MISCELLANEOUS HAZARDOUS MATERIALS

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. This section describes the handling, segregation, packaging, labeling, transport, and disposal of Hazardous Substances and Universal Wastes generated by demolition and or renovation activities. These wastes, classified by the EPA under the Hazardous Waste Management System (40 CFR Parts 260 through 279), require specialized handling, packaging, labeling, shipment, and ultimately recycling or disposal at an approved facility.

1. Universal Wastes: as defined by the Environmental Protection Agency (EPA) and various state departments. Materials that are classified as hazardous wastes, but are exempt from hazardous waste regulations provided they are collected for recycling. This includes but not limited to:
   a. High Intensity Discharge (HID) Bulbs
   b. Fluorescent light bulbs
   c. PCB containing ballasts
   d. Used batteries
   e. Mercury-containing equipment
   f. used thermostats
2. Hazardous Waste: as defined by the EPA and various state departments. This generally includes wastes that are ignitable, corrosive, reactive, toxic, or listed by state/federal agencies. This includes but not limited to:
   a. Lead Paint
   b. Asbestos
3. Protection of the environment as per Section 01 35 43, to include but not limited to, Dust and Air Monitoring Controls, Noise Control, Management and disposal of debris and other environmentally regulated materials, Spill Prevention and Response, Sediment and Erosion Control.

B. The Contractor must protect and preserve public and private property within and adjacent to the work site and use every precaution to prevent damage, injury, pollution or destruction. Precautions should be made to protect trees and other plants that are to remain.

C. The Contractor is responsible to conduct a survey and provide a report of all the universal and hazardous waste. The report is to be submitted to the Engineer for review prior to the start of the project.

D. High intensity discharge bulbs, fluorescent light bulbs and PCB containing light ballasts. These bulbs may contain mercury, PCB, lead and metals. All spent or discarded light bulbs (a.k.a. waste lamps) and light ballasts from this project shall be collected by the Contractor, handled, transported, and recycled or disposed of in accordance with 40 CFR 273.13 & 273 requirements for universal waste concerning waste lamps.

1.2 RELATED SECTIONS

A. Section 01 33 60 Safety, Health and Environmental Control

B. Section 01 35 29 Health, Safety and Environmental Response Procedures

C. Section 01 35 43 Environmental Protection

D. Section 01 74 19 Construction Waste Management and Disposal

E. Section 02 61 00 Sampling, Testing, Handling, Loading Removal and Disposal of Soils

F. Section 02 82 00 Lead-Containing Materials

G. Section 02 82 13 Asbestos Abatement

H. Section 31 20 00 Earth Moving

1.3 CODES AND REGULATIONS

A. The Contractor is to comply with all applicable Federal, State, laws, ordinances and regulations pertaining to environmental protection to include but not limited to the programs in the New York State Department of Environmental Conservation (DEC) Division of Environmental Remediation (DER) and Commissioner Policies (CP). This is to include the management, hauling and disposal of hazardous and universal waste.

B. The Contractor is to take full responsibility and liability for the compliance with all applicable Federal, State, and local regulations pertaining to hazardous waste management and disposal.

C. Federal Requirements which govern the management, hauling and disposal of hazardous waste include but are not limited to the following:
   1. DOT: U.S. Department of Transportation, including, but not limited to:
      a. Hazardous Substances Title 49, Part 171 and 172 of the Code of Federal Regulations
      b. Hazardous Materials Regulations
      c. General Awareness and Training Requirements for Handlers, Loaders and Drivers Titles 49, Parts 171-180 of the Code of Federal Regulations
      d. Hazardous Materials Regulations Editorial and Technical Revisions Title 49, Parts 171-180 of the Code of Federal Regulations.
   2. Handling and transport of universal waste is to be in accordance with 40 CFR 273. The Design Builder is to minimize the amount of hazardous waste and look for areas to reduced and prevent items that are hazardous waste from being disposed in a landfill. A plan to reduce the amount of universal waste and reduce material is to be submitted to the Engineer for approval.
   3. 40 CFR 260 Hazardous Waste Management System

D. EPA: U.S. Environmental Protection Agency, including but not limited to Management of Hazardous Wastes, Resource Conservation and Recovery Act (RCRA), Title 40, Parts 260-268 of the Code of Federal Regulations

E. OSHA: Occupational Safety and Health Administration including, but not limited to OSHA General Industry Safety and Health Standards (29 CFR 1910) and OSHA Construction Industry Standards (29 CFR 1926).

F. State Requirements: State requirements which govern the management, hauling and disposal of hazardous waste include but are not limited to the following, New York State Department of

Environmental Conservation (NYSDEC), Hazardous Waste; Title 6, NYCRR, Sections 364, 371, 372, and 373.

1.4 SUBMITTALS

A. All plans and programs and surveys are to be submitted within thirty (30) calendar days after receipt of Notice of Award, the Design Builder shall submit a Plan(s) to the Engineer for approval. The plan should detail all measures and procedures to be under taken by the Contractor 30 days prior to starting construction activities.

B. Provide the following submittals to the Engineer approval prior to the start of Work:
   1. Submit a Health and Safety Plan (as per Section 01 33 60), Spill Prevention Plan, Dust Control Plan and Noise Surveys (as per Section 01 35 43).
   2. Submit the name of the waste hauler (s) as listed in Section 02 61 00 along with a copy of state and local license and permits for waste hauling.
   3. U.S. EPA Identification Number of waste hauler.
   4. Name and address of waste disposal facility where waste materials are to be disposed including:
      a. Contact person and telephone number.
      b. Copy of state license and permit.
      c. Disposal facility permits.
   5. Copy of Uniform Hazardous Waste Manifest form or Bill of Lading as appropriate.
   6. Copy of EPA “Notice of Hazardous Waste activity” form.
   7. Copy of forms required by state and local agencies.
   8. Provide copies of sample data taken in accordance with Section 02 61 00.
   9. Provide sample of disposal label to be used.
   10. Type of personal protective equipment and work procedures to be used.

C. During Work, submit to the Engineer copies of all executed manifests, disposal site receipts or certificates of destruction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Disposal Bags: Provide 0.15mm (6-mil) thick leak-tight polyethylene bags.

B. DOT Hazardous Waste Disposal Drums: Provide DOT 17-H Open – Top Drums (55 gallon) in accordance with DOT regulations title 49 CFR Parts 173, 178, and 179.

C. DOT Hazardous Waste Labels: in accordance with DOT regulations Title 49 CFR Parts 173, 178, and 179.

2.2 LIGHT FIXTURES

A. Lighting is to include but not be limited to mercury bulbs, switch components, PCB-containing light fixtures & ballast, fluorescent, incandescent, high pressure light bulbs, high intensity discharge bulb.

B. Removal Procedures: Remove bulb, switch or component by manufacturer's standard installation, removal procedure, or in such a manner as to not damage the bulb, switch or component. Follow waste containerizing and labeling procedures.

2.3 BATTERIES

A. Batteries that are not hazardous at the time of disposal need not be managed as Universal Waste. Non-hazardous batteries include alkaline, carbon zinc, chloride zinc (commonly labeled *heavy duty*), nickel metal hydride (NiMH), zinc air, and lithium batteries that are nine volts or less and higher voltage lithium batteries that have been discharged to less than one volt. These batteries are to be recycled.

B. The term "battery" also includes intact, unbroken batteries from which the electrolyte has been removed (40 CFR 260.10 and 273.9). In relation to the concept of universal wastes, this term includes all batteries except (40 CFR 273.2(b)):
   1. Spent lead acid batteries that are managed under 40 CFR 266, Subpart G (reclamation of spent lead acid batteries that are recyclable), batteries as defined above that are not yet wastes under 40 CFR 261, including those that do not meet the criteria for waste generation (see definition of Waste Battery), and batteries as defined above that are not hazardous waste. A battery is a hazardous waste if it exhibits one or more of the characteristics identified in 40 CFR 261, Subpart C.

2.4 MERCURY CONTAINING EQUIPMENT

A. A device or part of a device or part of a device (including thermostats, but excluding batteries and lamps) that contains elemental mercury integral to its function (40 CFR 260.10 and 273.9).

B. The requirements of 40 CFR 273 do not apply to persons managing the following mercury-containing equipment (40 CFR 273.4(b)):
   1. Mercury-containing equipment that is not yet a waste under 40 CFR 261.
   2. Mercury-containing equipment that is not a hazardous waste. Mercury- containing equipment is a hazardous waste if it exhibits one or more of the characteristics identified in 40 CFR 261, subpart C, or is listed in 40 CFR 261, subpart D.
   3. Equipment and devices from which the mercury-containing components have been removed.

2.5 HAZARDOUS WASTE PACKAGING AND LABELING

A. Segregate And Package Each Waste Type as follows:
   1. Package switches, components in DOT 17-H Open-Top Drums with Polyethylene disposal Bag liners.
   2. Fill liner bags with only one type of waste, then neck liner bags down into DOT 17-H Open-Top Drum and seal with duct tape.
   3. Install gasket on lid, apply lock ring, and seal.

B. Universal Waste
   1. Apply Waste Label to drum side.
   2. Enter appropriate DOT Shipping Data, for example:
   3. PCB Waste – "Waste PCB Light Ballasts" – RQ, Polychlorinated Biphenyls Mixture, 9, UN2315, PG III

4. Adjacent to each label, enter the date indicating when waste was first placed in each drum.

C. Sealed and Labeled Containers: maintain all containers in a continuously sealed condition after they have been sealed.
   1. Do not reopen sealed containers.
   2. Do not place additional waste in sealed containers.

2.6 TEMPORARY STORAGE

A. See Section 3.02 for Handling of Waste.

B. Partially filled containers of waste may be stored at the work site for intermittent packaging provided that:
   1. Each container is properly labeled when it is first placed in service;
   2. Each container remains closed at all times except when compatible waste types are added.

C. When moved within the site, each container remains within the geographic boundaries of the facility without moving or crossing public access highways.

D. Immediately seal containers of waste as each container is filled. Remove containers of waste from the work site within 45 days from start of accumulation. All containers are to be marked with the start date of accumulation.

E. Continuously maintain custody of all hazardous material generated at the work site including security, short-term storage, transportation and disposition until custody is transferred to an approved disposal site or recycling center. Document continuous chain-of custody and waste manifest.

PART 3 - EXECUTION

3.1 GENERAL

A. Do not mix potentially hazardous waste streams. Where feasible, separate each type of waste from other types of hazardous wastes, from asbestos waste and from construction waste. Hazardous waste is defined in 40 CFR Part 261, New York State ECL Section 27-09 or 6 NYCRR Part 371 (Identification and Listing of Hazardous Waste). See Section 01 74 19.

B. Segregate, package, label, transport and dispose of Waste in accordance with DOT, EPA, State and Local regulations.

C. The following hazardous wastes that are managed under the universal waste requirements of 40 CFR 273 (40 CFR 260.10 and 273.9):
   1. Batteries as described in 40 CFR 273.2 (see definition of Battery)
   2. Pesticides as described in 40 CFR 273.3 (see definition of Pesticides)
   3. Mercury-containing equipment as described in 40 CFR 273.4 (see definition of Mercury-Containing Equipment)
   4. Lamps as described in 40 CFR 273.5 (see definition of Lamp).

3.2 HANDLING OF WASTE

A. Hazardous and dangerous waste generated within the job site shall not be moved except in accordance with Federal and State regulations. If the presence of hazardous waste is confirmed, the Metro-North Department of Environmental Compliance and Services shall be advised promptly.

B. In no event shall hazardous waste remain on the site for more than 60 days from generation. All hazardous materials and or waste are to be stored in compatible and regulated storage containers/drums, provide the MSDS to the Engineer. All materials are to placard and stored in accordance with State and Federal regulations.

C. Off-site disposal facilities must be approved by the Engineer as listed in Section 02 61 00 prior to disposal. Testing and sampling of materials and waste are to be done in accordance with Section 02 61 00.

D. Signed Originals of Weight Tickets/Bill-of-Lading and/or Waste Profile Sheets; Waste Manifests (for Hazardous Waste) are to be turned over to the Engineer after making copies of each following each waste shipment. Copies of the Chain of Custody are to be given to the Engineer in accordance with Section 02 61 00.

E. Employee training shall ensure that all employees are thoroughly familiar with proper waste handling and emergency procedures, relative to their responsibilities during normal operations and emergencies and to the type of waste they are handling.
   1. Documentation when a universal waste in storage was first accumulated shall be provided. This is to be done by dating and labeling the waste with the date of the earliest accumulation that can document the length of time the universal waste has been accumulated.
   2. Maintenance of an inventory system on-site that identifies the earliest date that any universal waste in a group of universal waste items or a group of containers of universal waste became a waste was received.
   3. Any waste developed from the work that exhibits one or more characteristics of hazardous waste, that are not specifically identified by EPA and DEC as Universal Waste, must be handled accordingly and not as a universal waste. See the Hazardous Waste Disposal Specification for those wastes.

F. Off-Site Shipment of Universal Waste
   1. Off-Site shipments shall meet the requirements for offsite shipments and is prohibited from sending or taking universal waste to a place other than a designated universal waste handler or a universal waste destination facility.

END OF SECTION

SECTION 03 01 30.71 - REHABILITATION OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This specification describes the patching of exterior surfaces with a hand applied portland cement, repair mortar.

1.2 QUALITY ASSURANCE

A. Manufacturing qualifications: The manufacturer of the specified product shall be ISO 9001 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.

B. Contractor qualifications: Contractor shall be qualified in the field of concrete repair and protection with a successful track record of 5 years or more. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative.

C. Install materials in accordance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction.

1.3 RELATED SECTIONS

A. Section 09 96 23 - Graffiti Resistance Coatings

1.4 DELIVERY, STORAGE, AND HANDLING

A. All materials must be delivered in original, unopened containers with the manufacturer’s name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.

B. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use.

C. Condition the specified product as recommended by the manufacturer.

1.5 JOB CONDITIONS

A. Environmental Conditions: Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Minimum application temperature 45ºF (7ºC) and rising.

B. Protection: Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified material.

1.6 SUBMITTALS

A. Comply with Section 01 30 00 – SUBMITTALS.

B. Submit two copies of manufacturer's literature, to include: Product Data Sheet, System Data Sheet, Application Guide, and appropriate Material Safety Data Sheets (MSDS).

1.7 WARRANTY

A. Provide a written warranty from the manufacturer against defects of materials for a period of five (5) years, beginning with date of substantial completion of the project.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. SikaRepair SHB, as manufactured by Sika Corporation Concrete Restoration

B. Systems

C. Nox-Crete Products Group

D. JE Tomes & Associates, Inc.

E. Or approved equal.
   1. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section - 01600 Products & Substitutions. When submitting request for substitution, provide complete product data specified above under Submittals, for each substitute product.

2.2 MATERIALS

A. Portland cement mortar:
   1. The repair mortar shall be a blend of selected portland cements, specially graded aggregates, admixtures for controlling setting time, water reducers for workability, and an organic accelerator.
   2. The materials shall be non-combustible, either before or after cure.
   3. The materials shall be supplied in a factory-proportioned unit.
   4. The portland cement mortar must be placeable from ¼-in. to 3-in. in depth per lift for vertical applications and ¼-in to 1 ½-in in depth per lift for overhead applications.

2.3 PERFORMANCE CRITERIA

A. Typical Properties of the mixed portland cement mortar:
   1. Working Time: Approximately 30 minutes
   2. Finishing Time: 35 - 50 minutes
   3. Color: concrete gray

B. Typical Properties of the cured portland cement mortar:
   1. Compressive Strength (ASTM C-109 Modified)
      a. 1 day: 2500 psi min. (17.2MPa)
      b. 28 day: 5000 psi min. (34.5MPa)
   2. Flexural Strength (Modulus of Rupture)(ASTM C-293) at 28 days: 800 psi (5.5MPa)
   3. Bond Strength (ASTM C-882 Modified) at 28 days: 1000 psi (6.8MPa)
   4. The portland cement mortar shall not produce a vapor barrier.
   5. Density (wet mix): 106 lbs. / cu. ft.
      a. Tests above were performed with the material and curing conditions at 71°F - 75°F and 45-55% relative humidity.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Substrate must be clean, sound, and free of all loose and deteriorated concrete. The surface must be mechanically prepared. Substrate must have a surface profile of +/- 1/16-in. (CSP 5 or greater as per ICRI guidelines) with a new aggregate surface. Area to be patched shall not be less than 1/4-in. in depth.

3.2 MIXING AND APPLICATION

A. Mixing the portland cement mortar: Mix manually or mechanically. Manually mix in a wheel barrow or mortar box. Mechanically mix in appropriate sized mortar mixer or with a mud/mortar paddle and low speed (400-600 rpm) drill. Wet down all tools and mixer to be used. Add approximately ¾ gallon of water to mixing container. Slowly add 1 bag of the repair mortar while continuing to mix. Water may be varied up to a maximum one gallon to achieve the desired consistency. DO NOT OVERWET. Total mixing time should not exceed 3 minutes. Mix temperature should be maintained at 65°-75° F by warming or cooling the water, as required.

B. Placement Procedure: At the time of application, the substrate should be saturated surface dry with no standing water. Mortar must be scrubbed into substrate filling all pores and voids. While the scrub coat is still plastic, force material against edge of repair, working toward center. After filling, consolidate, then screed. Allow mortar to set to desired stiffness. Then finish with steel trowel, wood, plastic or sponge float for desired surface texture. Areas where the depth of the repair to sound concrete is greater than 3-in.in depth vertical or 1 ½in. in depth overhead, repair shall be made in lifts. The top surface of each lift shall be scored so as to produce a roughened surface for the next lift. The preceding lift should be allowed to reach final set before applying fresh material. The fresh mortar must be scrubbed into the preceding lift.

C. As per ACI recommendations for portland cement concrete, curing is required. Moist cure with wet burlap and polyethylene, a fine mist of water or a water based* compatible curing compound. Moist curing should commence immediately after finishing and continue until the compressive strength is 70% of the 28-day compressive strength. If necessary, protect newly applied material from rain. To prevent from freezing cover with insulating material. Setting time is dependent on temperature and humidity.
   1. *Pretesting of curing compound is recommended.

D. Adhere to all limitations and cautions for the portland cement mortar in the manufacturer's technical data sheet and literature.

3.3 CLEANING

A. The uncured portland cement mortar can be cleaned from tools with water. The cured portland cement mortar can only be removed mechanically.

B. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.
   1. Repair area shall not be less than ¼" in depth.
   2. Substrate should be saturated surface dry (SSD) with no standing water during application.
   3. Apply scrub coat to substrate, filling all pores and voids.
   4. While scrub coat is still wet apply repair mortar.
      a. For applications greater than 3-in. (vertical) or 1 ½-in. (overhead) in depth, apply repair mortar in lifts. Score the top surface of each lift to produce a roughened surface for the next lift. Allow preceding lift to reach final set. Repeat from step 2.

END OF SECTION

SECTION 03 10 00 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements for providing the concrete formwork for construction of all concrete structures set forth on the Contract Drawings and in the Specifications.

1.2 REFERENCED SECTIONS

A. Division 1 – General Requirements; Submittal Procedures

1.3 CITED STANDARDS

A. American Concrete Institute (ACI):
   1. ACI 347, Guide to Formwork for Concrete.
   2. ACI 318/318R, Building Code Requirements for Structural Concrete and Commentary.

B. APA-The Engineered Wood Association (APA):
   1. APA Panel Handbook & Grade Glossary.

C. Southern Pine Inspection Bureau (SPIB):
   1. SPIB Standard Grading Rules for Southern Pine Lumber.

D. U. S. Government:
   1. U.S. Department of Commerce (DOC):
      a. Technology Administration, National Institute of Standards and Technology (NIST):
         1) DOC Voluntary Product Standards:
            a) PS-1, Construction and Industrial Plywood.
            b) PS-20, American Softwood Lumber Standard.

E. Western Wood Products Association (WWPA):
   1. WWPA Western Lumber Grading Rules ‘98.

1.4 QUALITY CONTROL

A. Certifications:
   1. Submit certification that material is acceptable for structures processing or storing potable water.

1.5 SUBMITTALS

A. Prior to the start of the work of this Section, submit the following information for approval in accordance with the requirements of Division 1 – General Requirements, Submittal Procedures:

1. Product Data and current specifications for the following:
   a. Form coating materials.
   b. Form ties.
2. Quality Assurance/Control Submittals:
   a. Certificates:
      1) Certification that material is acceptable for structures processing or storing potable water.

1.6 GENERAL DESIGN AND FABRICATION REQUIREMENTS

A. Design the formwork and falsework in accordance with ACI 347 and the following:
   1. Include assumed values of live load, dead load, weight of moving equipment operated on the formwork, temporary construction material, foundation pressures, stresses, lateral stability, and such other factors pertinent to safety of the structure during construction in the design.
   2. Design the formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent construction.
   3. Earth forms are not permitted.

B. Design the formwork to ensure that the tolerances indicated are held, and factors pertinent to the safety of personnel during construction are included.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Framing, Sheathing, Struts, Braces, and Shoring for Forms: Provide framing, sheathing, struts, braces, and shoring for the forms made from lumber conforming to WWPA Grading Rules or SPIB Grading Rules.

B. Rough Structural and Dimension Lumber: Provide lumber of allowable species, surfaced on four sides as applicable, and grade stamped with the appropriate WWPA or SPIB stamp indicating product compliance with PS-20-94.

C. Form Sheathing and Panels: Provide Exterior Type B-B Plywood Class I and II for form sheathing and panels that conforms to U.S. Product Standard PS-1-95, and that is not less than 5/8 inch thick.
   1. On surfaces not exposed to view, only use Class II plywood.

D. Metal Forms:
   1. Steel forms of a pre-engineered standard design, conforming to the concrete sections indicated on the Contract Drawings, may be used in lieu of wood forms.
   2. Do not use stay-in-place metal forms.

E. Form Ties:
   1. Provide factory-fabricated, adjustable-length, removable or snap-off metal form ties conforming to ACI 347.
      a. Do not fabricate wire ties, flat bands, or form ties on the Site.
   2. Removable Ties:
      a. For ties that are designed to be completely removed, taper the ties over their full length that passes through the concrete.

1) For liquid containment structures, install tapered ties so the large end of the taper is on the liquid side of the concrete wall.
2) In building foundation walls, install tapered ties so the large end of the taper is on the ground side of the concrete wall.

b. Do not use removable type ties that leave holes larger than one inch.
c. Do not use removable type ties to construct liquid-retaining concrete structures.

3. Snap-off Metal Ties:
   a. Provide snap-off metal ties with ends that break at least 1 1/2 inches from the face of the wall.
4. Do not use wood spacers.
5. To construct liquid-retaining structures and structures designed to exclude groundwater, use ties designed to prevent seepage or flow of water along the embedded tie.
6. Submit Product Data and current specifications for the form tie materials.

F. Form Coatings:
   1. Provide commercial formulation form-coating compounds that do not bond with, stain, or affect concrete surfaces.
      a. Provide form-coating compounds that do not impair subsequent treatment of concrete surfaces requiring bond or adhesion, or impede the wetting of surfaces to be cured with water or curing compounds.
   2. For surfaces designed to be in contact with potable water, do not use coating material that will add taste, odor, or toxic effects to the water.
   3. Submit Product Data and current specifications for the form coating materials.
   4. Fuel shall not be used as a form release agent.

2.2 SOURCE QUALITY CONTROL

A. Provide lumber free of material defects that would deform the finished concrete product.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to placement of concrete, inspect the forms to verify the accuracy of their alignment and for cleanliness.

3.2 PREPARATION

A. Apply form coatings in accordance with the coating manufacturer's specifications.

B. Do not allow excess form coating material to accumulate in the forms.

C. Do not allow form coatings to come in contact with construction joints and reinforcing steel.

3.3 ERECTION

A. Construct the forms in accordance with ACI 347 and to the required dimensions; and erect them plumb, straight, mortar tight, and paste tight where appearance is important.
   1. Fabricate forms for easy removal without hammering or prying against concrete surfaces.
   2. Form intersecting planes to provide true, clean-cut corners with the concrete not exposed to the edge grain of plywood.
   3. Securely brace and shore the forms to prevent displacement, bowing, pillowing, and to safely support the imposed concrete load.
   4. Provide offsets, keyways, recesses, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and such other features as required.

B. Build into the forms items such as inserts, anchors, miscellaneous metal items, and other embedded items indicated on the Contract Drawings; or otherwise secure these items in the forms.
   1. Accurately place and securely support items to be built into forms.

C. Openings:
   1. Provide temporary openings where the interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, or for placement of concrete.
      a. Locate temporary openings on forms in locations as inconspicuous as possible consistent with the requirements of the work.
      b. Provide openings in concrete formwork of the correct size and in the proper location to accommodate other items and operations of construction work passing through the forms.
   2. Securely brace and set temporary openings tightly to forms to prevent the loss of concrete mortar.

D. Wet wooden forms sufficiently to prevent the joints from opening prior to the concrete pour.

3.4 SITE TOLERANCES

A. Set and maintain concrete forms within allowable tolerance limits stated in ACI 347.

3.5 FORM REMOVAL

A. If the atmospheric temperature at the site has been continuously above 50 degrees Fahrenheit from the time of the pour, remove the forms at the earliest practical time within the limits set forth in this Paragraph, and maintain wet curing without delay.
   1. Forms for walls and other vertical faces may be carefully removed 24 hours after the last portion of concrete in the section involved has been placed, provided the concrete has sufficiently hardened to preclude damage resulting from form removal, and provided these members are not subjected to loads for a period of 14 days.
   2. Maintain horizontal forms in place for a minimum of 14 days or until the concrete, as determined by job-cured cylinders, has attained a compressive strength of 3000 psi.
   3. If a water-reducing retarder is used in the concrete mix, the normal time period for removing forms may need to be increased.

B. If the atmospheric temperature at the site drops below 50 degrees Fahrenheit, leave all forms in place for at least five (5) days regardless of the temperature within protective coverings or enclosures.

C. Remove forms in accordance with ACI 347 without damaging the concrete and in a manner that ensures complete safety and serviceability of the structure.
   1. Do not cut form ties back from the face of the concrete.
   2. Concrete containing slag ground granulated blast furnace slag tends to develop strength slower than a concrete containing 100 percent Portland cement, so forms for such concrete may need to be left in place longer.

D. Do not remove supporting forms or shoring until the members have acquired sufficient strength to safely support their weight and the anticipated construction loads without distortion or excessive deflection.

3.6 RE-INSTALLATION

A. Forms may be re-used, only if they meet the same requirements as new forms with respect to their effect on poured concrete appearance and structural stability.

B. Reusing concrete forms may not cause delays or changes in the concrete pour schedule when compared to the concrete pour schedule that is made possible by using all new forms in the case of wood forms, or by having available the total number of forms required in the case of metal forms.

3.7 FIELD QUALITY CONTROL

A. Notify the Engineer upon removal of a concrete pour's forms so that a review of the newly stripped surfaces may be made before patching takes place.

B. Examine concrete surfaces following removal of forms to verify that they do not contain residual form coating that will interfere with other materials or coatings to be applied.
   1. If detrimental form coating is found, use approved methods to remove it prior to applying other materials or coatings.

3.8 PROTECTION

A. Protect formwork materials before, during, and after erection to ensure acceptable finished concrete work.

B. The Engineer's consent to remove forms does not relieve the Contractorof the responsibility for the safety of the work.

C. Protect in-place materials and the work of other trades during concrete work.

END OF SECTION

SECTION 03 16 00 - CONCRETE ANCHORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements pertaining to post-installed anchors for materials and equipment. This section pertains to all other sections of these specifications that require post-installed anchors in cracked concrete, unless specified otherwise.

1.2 RELATED DOCUMENTS

A. Division 1 – Specification Section
B. Division 3 – Concrete
C. Division 5 – Metals

1.3 REFERENCES

A. American Concrete Institute (ACI)

1. ACI 318 – Building Code Requirements for Structural Concrete

2. ACI 355.2 – Standard for Evaluating the Performance of Post-Installed Mechanical Anchors in Concrete

B. American Society for Testing and Materials (ASTM)

1. ASTM A36 – Standard Specification for Carbon Structural Steel

2. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

3. ASTM A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service

4. ASTM A510 - 08 Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel

5. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel

6. ASTM B695 – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel

7. ASTM C881 – Standard Specification Epoxy-Resin-Based Bonding Systems for Concrete

8. ASTM E488 – Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

9. ASTM E1512 – Standard Test Methods for Testing Bond Performance of Bonded Anchors

10. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

1.4 QUALITY ASSURANCE

A. Post-Installed anchors and related materials shall be listed by one or more of the following agencies, as applicable:

1. Underwriters Laboratories (UL) and/or Factory Mutual (FM)

1.5 SUBMITTALS

A. Product Data: Submit data for proprietary materials, manufacturer's specifications (including finishes and/or materials), Material Safety Data Sheets (MSDS) and installation procedures.

B. Test Reports: International Code Council (ICC)-ES listings and performance data that includes recommended loading for each application.

C. Only manufacturers with an ICC-ES listing will be considered for substitution requests. The contractor shall submit for Engineer's review, calculations that are prepared & sealed by a registered Professional Engineer demonstrating that the substituted product is capable of achieving the pertinent equivalent performance values of the specified product using the appropriate design procedure and/or standard(s) as required by the New York State Building Code, ACI 318 Appendix D and contract documents. In addition, the calculations shall specify the diameter and embedment depth of the substituted product. Any increase in material costs for such submittal shall be the responsibility of the contractor.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to job site in manufacturer's or distributor's packaging undamaged, complete with installation instructions.

B. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage or deterioration.

PART 2 - PRODUCTS

2.1 CRITERIA

A. ADHESIVE ANCHORS

1. An adhesive anchors shall consist of:

a. Inserts shall meet the requirements of AISI 304 or AISI 316, ASTM F593 CW1 for threaded rods and ASTM F594 for nuts. Unless otherwise noted, anchor rods shall be HAS- by Hilti Inc. or approved equal.

b. An adhesive formula shall be of the following:

2. Hybrid Urethane Methacrylate (HUM): Adhesive shall be a cartridge type, two-component, hybrid based system dispensed and mixed through a static mixing nozzle supplied by the manufacturer. The hybrid adhesive shall meet the minimum physical requirements of the specified material below. Acceptable installation and performance temperature ranges shall be verified with manufacturer's literature prior to installation.

Hybrid adhesives shall be HIT HY-150 MAX by Hilti Inc., or approved equal.

3. Adhesive Limitations:

a. Installation Temperature: When the base material temperature drops below 40-degrees F, only Hybrid Urethane Methacrylate or approved equal, adhesives shall be used for installations. See manufacturer's instructions for additional minimum temperature requirements.

b. Oversized Holes: Refer to manufacturer's information for recommended field-drilled hole sizes.

c. Core-drilled holes: Refer to manufacturer's information if holes are drilled with a core-drill bit.

B. EXPANSION ANCHORS

1. Provide Stainless Steel expansion anchors as shown in the contract drawings.

C. ANCHOR SIZES

1. The anchor size (nominal diameter and embedment depth) shall be as indicated on the drawings. If not indicated on the drawings, sizes shall be provided as required to maintain not less than the appropriate Code safety factors over manufacturer's performance load tables. If the actual concrete compressive strength is not known, the compressive strength shall be determined through testing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Where manufacturer recommends use of special tools for installation of anchors, such tools shall be used, unless otherwise permitted specifically by the Engineer.

B. Where holes are drilled in concrete or masonry, holes shall be accurately and squarely drilled, and the holes shall be sized and cleaned in accordance with the manufacturer's recommendations.

3.2 FIELD QUALITY CONTROL

A. Special Inspection, periodic or continuous, of post-installed anchors shall be provided as required by ICC-ES evaluation reports and/or as specified by the Engineer. This service shall be performed by personnel independent of the Manufacturer or Contractor so as to prevent a conflict of interest.

B. Pullout Test: A single track-side anchor, per platform, per station shall be tested in the field, for a design pullout load of 1275 lbs with a maximum displacement of 0.001 inches. This load is not the anchor's capacity and is considered non-destructive. Field testing shall be performed in accordance with ASTM test standards. Upon failure of an anchor, the anchor shall be core drill out and replaced with a fully threaded, epoxy grouted rod of equal diameter with an anchor washer and nut on the underside of the wall/floor.

END OF SECTION

SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements for furnishing and installing reinforcement for concrete structures.

1.2 REFERENCED SECTIONS

A. Division 1 – General Requirements – Submittal Procedures.

B. Section 03 10 00 – Concrete Forming and Accessories

C. Section 03 30 00 – Cast-In-Place Concrete.

1.3 CITED STANDARDS

A. American Concrete Institute (ACI):
   1. ACI 315, Details and Detailing of Concrete Reinforcement.
   2. ACI 318, Building Code Requirements for Structural Concrete.

B. American Society for Testing and Materials (ASTM):
   1. ASTM A 1064/A 1064M, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
   2. ASTM A 615/A6 15M, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
   3. ASTM A 767 / A 767M, Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
   4. ASTM A 641/ A 461M, Standard Specification for Zinc – Coated (Galvanized) Carbon Steel Wire.

C. Concrete Reinforcing Steel Institute (CRSI):
   1. CRSI Manual of Standard Practice.

1.4 QUALITY CONTROL

A. Certifications:
   1. Submit certification that material meets specified requirements.

1.5 SUBMITTALS

A. Prior to the start of the work of this Section, submit the following information to the Engineer for approval in accordance with the requirements of Division 1 – General Requirements, Submittal Procedures:
   1. Product Data
      a. Submit the manufacturer's descriptive product data and current specification for each product specified herein, include installation instructions.
         1) Reinforcing steel.
         2) Rebar splicing coupler.
         3) Slab joint dowel b6ars.
         4) Deformed bar anchors.
   2. Shop Drawings
      a. Prepare Shop Drawings of concrete reinforcement in accordance with ACI 315.
      b. Provide drawings showing all fabrication dimensions and locations for placing reinforcement and bar supports; indicate bending diagrams, splicing and lap of rods, shapes, dimensions and details of bar reinforcing and accessories.
   3. Test Reports
      a. Submit copies of test reports showing the results of tests conducted in accordance with the American Society for Testing and Materials Specifications listed in Paragraph 7.02B.
      b. Test Requirements may be waived, if certified copies of mill test reports that show compliance with specified requirements are provided.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage of Materials:
   1. Store concrete reinforcing materials in a manner that prevents excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.

B. Identify bundles of reinforcing steel with tags wired to the reinforcing steel.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing Steel:
   1. Reinforcement Bars: Provide deformed steel reinforcement bars in accordance with the requirements of ASTM A 615/A615M, Grade 60. Rebar should be galvanized conforming to the requirements of ASTM A 767/A 767M, Class I zinc coated, hot-dip galvanized.
   2. Wire and Welded Wire Fabric: Provide wire and welded wire fabric in accordance with the requirements of ASTM A 1064/A 1064M.
      a. Galvanized: Provide galvanized reinforcing wire and welded wire fabric to the requirements of ASTM 641/A 641M.
      b. Metal Accessories: Provide metal accessories in accordance with the requirements of the CRSI Manual of Standard Practice.

B. Rebar Splicing Coupler:

1. Use a rebar splicing coupler only where one is shown on the Contract Drawings or where approved by the Engineer.
2. Provide a two-piece dowel bar splicer system manufactured from ASTM A 615/A615M Grade 60 deformed rebar, and consisting of a rebar externally-threaded on the splice end, or "dowel-in", which can be threaded into an internally-threaded hole in a "dowel bar splicer" factory-forged onto the end of the mating rebar and equipped with an integral nailing flange plate.
3. The strength of the completed splice must exceed the tensile strength requirements of ACI 318.
4. Where "dowel bar splicers" are provided for mating with "dowel-ins" to be installed later, install the coupler manufacturer's plastic internal coupler protectors in the "dowel bar splicers".
5. Provide solid plastic sleeves placed over the "dowel-in" ends to protect the threading from damage, contamination, and rust.
6. Acceptable Manufacturers:
   a. Dayton/Richmond Concrete Accessories, www.daytonrichmond.com.
   b. Approved equal.

C. Slab Joint Dowel Bars:
1. To transfer shear forces at slab joints, provide plain round dowel bars conforming to requirements of ASTM A 663/A663M, Grade 70, 75, or 80; and which are not burred, roughened, or deformed out-of-round so that slippage is not hindered.
2. Coat the slab joint dowel bars with curing compound conforming to the requirements specified in Section 03 30 00, Cast-In-Place Concrete, to render the surface of the bars bondless.

D. Deformed Bar Anchors:
1. Provide deformed anchors conforming to the requirements of ASTM A 496 with a minimum yield strength of 50 ksi and a minimum ultimate tensile strength of 61 ksi.
   a. Provide low carbon steel anchors with the following composition:
      1) Carbon: 0.23 percent, maximum.
      2) Manganese: 0.90 percent, maximum.
      3) Phosphorus: 0.040 percent, maximum.
      4) Sulfur: 0.050 percent, maximum.
   b. Provide flux-filled deformed bar anchor similar to Nelson Stud Welding, Inc. Type D2L.
2. Acceptable Manufacturers:
   a. Nelson Stud Welding, Inc., www.nelsonstud.com.
   b. Approved equal.

2.2 FABRICATION

A. Fabricate reinforcement to the dimensions indicated on the Contract Drawings and within the tolerances given in ACI 315.

B. Bend steel reinforcement using the cold bending method.
1. Do not use bars with kinks or bends not indicated on the Contract Drawings.
2. Fabricate bar shapes in a manner that will not injure the material or lessen the member strength.
3. Use either a hand- or power-operated bending machine designed for bending reinforcing steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Placing Concrete Reinforcement:
   1. Place metal concrete reinforcement accurately and in accordance with ACI 318.
      a. Do not lay metal reinforcement on formwork.
      b. Terminate reinforcement two inches from the face of expansion joints.
      c. Continue reinforcement across or through construction joints.
      d. Place additional concrete reinforcement around openings in slabs and walls as detailed on the Contract Drawings.
      e. Use reinforcing accessories to securely brace the reinforcement against displacement outside of permitted tolerances.
   2. Slab Reinforcement:
      a. Install welded wire fabric as indicated, lapping joints eight inches and securely wiring the joints together.
      b. Extend welded wire fabric to within two inches of sides and ends of slabs.
      c. To support slab reinforcement from the ground, place the reinforcement on concrete blocks of the correct height and having a compressive strength equal to or greater than the specified compressive strength of concrete being placed.
         1) Use concrete blocks not larger than 3 inches by 3 inches and of a height equal to required bottom steel cover.
      d. To support slab reinforcement from formwork, place the reinforcement on bar chairs made of plastic or metal.
      e. Field weld deformed bar anchors to slab edge steel bent plate as shown on the Contract Drawings.
   3. Provide fiber reinforcement in concrete sidewalks and in other applications as indicated on the Contract Drawings.

B. Concrete Reinforcement Field Bends:
   1. Do not field bend bars partially embedded in concrete unless approved by the Engineer.
   2. When obstructions interfere with the placement of reinforcement, pass such obstructions by placing reinforcement around it.
      a. Do not bend the reinforcement to clear the obstructions.

C. Splicing Concrete Reinforcement:
   1. Splice metal reinforcement in accordance with ACI 318 and as indicated on the Contract Drawings.
      a. Make mechanical butt splices in accordance with the rebar splicing coupler manufacturer's installation instructions.
   2. Secure metal reinforcement at intersections with not less than 16-gauge annealed wire or appropriately sized clips.
      a. When bar spacing is less than 12 inches, tie alternate intersections.
      b. Do not tack-weld crossing bars.

D. Slab Joint Dowel Bar Installation:
   1. Install one-half the length of the coated bar dowel into the slab to be poured.

3.2 FIELD QUALITY CONTROL

A. Notify the Engineer 48 hours before placing concrete so the placement of metal reinforcement can be inspected.

3.3 CLEANING

A. Clean or otherwise protect metal reinforcement so that at the time the concrete is placed, the reinforcement is free from rust, scale, or other coatings that could destroy or reduce the concrete to steel bond.

3.4 PROTECTION

A. Provide protection for concrete reinforcement during concrete pours in accordance with ACI 318, unless indicated otherwise on the Contract Drawings.

B. Protect in-place reinforcement from excessive construction traffic and other work.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements for designing the cast-in-place concrete mixes.

B. Requirements for furnishing, placing, and curing Portland cement concrete for concrete structures, both reinforced and un-reinforced, as indicated in the Contract Documents.

C. Requirements for testing and accepting of cast-in-place concrete structures.

1.2 REFERENCED SECTIONS

A. Division 1 – General Requirements - Submittal Procedures.

B. Section 03 10 00 - Concrete Forms and Accessories.

C. Section 03 20 00 - Concrete Reinforcement.

1.3 CITED STANDARDS

A. American Concrete Institute (ACI):
1. ACI 117/117R; Standard Specifications for Tolerances for Concrete Construction and Materials and Commentary.
2. ACI 211.1; Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
3. ACI 301; Specifications for Structural Concrete.
4. ACI 302.1R; Guide for Concrete Floor and Slab Construction.
5. ACI 304R; Guide for Measuring; Mixing, Transporting and Placing Concrete.
6. ACI 304.2R; Placing Concrete by Pumping Methods.
7. ACI 305R; Hot Weather Concreting.
8. ACI 306R; Cold Weather Concreting.
9. ACI 308R; Guide to Curing Concrete.
10. ACI 318/318R; Building Code Requirements for Structural Concrete and Commentary.

B. American Institute of Steel Construction, Inc. (AISC):
1. AISC 303, Code of Standard Practice for Steel Buildings and Bridges.

C. American Society for Testing and Materials (ASTM):
1. ASTM C 31/C 31M; Standard Practice for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C 33; Standard Specification for Concrete Aggregates.
3. ASTM C 39/C 39M; Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C 42/C 42M; Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

5. ASTM C 94/C 94M; Standard Specification for Ready-Mixed Concrete.
6. ASTM C 138/C 138M; Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
7. ASTM C 143/C 143M; Standard Test Method for Slump of Hydraulic-Cement Concrete.
8. ASTM C 150; Standard Specification for Portland Cement.
9. ASTM C 156; Standard Test Method for Water Retention by Concrete Curing Materials.
10. ASTM C 171; Standard Specification for Sheet Materials for Curing Concrete.
11. ASTM C 172; Standard Practice for Sampling Freshly Mixed Concrete.
12. ASTM C 173/C 173M; Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
13. ASTM C 192/C 192M; Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
14. ASTM C 231; Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
15. ASTM C 260; Standard Specification for Air-Entraining Admixtures for Concrete.
16. ASTM C 309; Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
17. ASTM C 494/C 494M; Standard Specification for Chemical Admixtures for Concrete.
18. ASTM C 779/C 779M; Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
19. ASTM C 881; Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
20. ASTM C 882; Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.
21. ASTM C 989; Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
22. ASTM C 1077; Standard Practice for Laboratories Testing Concrete and Concretes for Use in Construction and Criteria for Laboratory Evaluation.
23. ASTM C 1315; Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
24. ASTM D 638; Standard Test Method for Tensile Properties of Plastics.
25. ASTM D 695; Standard Test Method for Compressive Properties of Rigid Plastics.
26. ASTM D 1751; Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
27. ASTM E 329; Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

1.4 QUALITY CONTROL:

A. Qualifications:
   1. Testing and Inspection Agency Qualifications:
      a. Employ an independent Testing and Inspection Agency having the proper qualifications and having the following additional qualifications:
         1) Conforming to the quality standard requirements of ASTM C 1077.
         2) Capable of performing the reviews, inspections, and testing required by this Section; including but not limited to the following:
            a) Inspecting, sampling, and testing proposed materials and concrete production as required by the Building Code for compliance with the Contract Documents.
               (1) Capable of conducting concrete slump, strength, and air entrainment testing.

(2) Capable of securing production samples of materials at plants or stockpiles during the course of the work, and testing the samples for compliance with the Contract Documents.

b) Capable of reviewing and testing the Contractor's proposed mix designs.

B. Regulatory Requirements:
1. Only provide curing compounds which comply with the low volatile organic compound (VOC) requirements of the U.S. Environmental Agency as defined in 40 CFR Part 51.100.

C. Certifications:
1. Batch Mixing Plant Certification:
a. Submit to the Engineer and local authorities requiring them, certificates originated by the batch mixing plant certifying that the ready mixed concrete, as manufactured and delivered, is in conformance with ASTM C 94/C 94M.
2. Curing Compound/Architectural Finish Bond Certification:
a. Submit written certification by the product manufacturer that liquid membrane-forming curing compounds to be applied over concrete with an architectural finish is non-detrimental to the bond of the finish material.
3. Clear Curing and Sealing Compound Certification:
a. Submit written certification by the product manufacturer that liquid-type membrane-forming clear curing and sealing compound is compatible with other treatments and finishes to be applied to the concrete.
4. Mix/Admixture Certification:
a. Prior to submitting the concrete mix design to the Engineer for approval, submit written certification that the mix conforms to the requirements of proposed admixtures.

D. Field Samples:
1. Submit Samples of materials being used when requested by the Engineer, including the Samples' names, sources, and descriptions.

E. Pre-Installation Meetings:
1. Prior to placement of concrete, convene an onsite meeting to establish and coordinate procedures that will enable the Contractorto provide the best possible product under anticipated field conditions.
2. Required attendees to this meeting include representatives of organizations and material suppliers involved with the design and construction of floor slab.

1.5 SUBMITTALS

A. Submit the following information to the Engineer for approval in accordance with the requirements of Division 1 – General Requirements, Submittal Procedures:
1. Product Data:
a. Concrete materials and accessories per Subparagraph 1.04.D.1.
2. Shop Drawings:
a. Schedule showing construction methods, construction joint locations, and the sequence of pouring per Paragraph 1.10.A.
3. Samples:
a. Samples of materials being used per Paragraph 1.07.D.1.
4. Quality Assurance/Control Submittals:
a. Design Data.

1) Design mixes per Subparagraph 2.03.A.1.

b. Test Reports.
1) Source concrete test reports per Subparagraph 2.05.A.1.a.
2) Test reports for concrete slump per Subparagraph 3.05.A.1.f and Subparagraph 3.05.A.2.
3) Test reports for concrete air content tests for new concrete per Subparagraph 3.05.A.1.f and Subparagraph 3.05.A.3.
4) Test reports for new concrete strength tests per Subparagraph
5) 3.05.A.1.f and Subparagraph 3.05.A.4.
6) Test reports for concrete core tests for in-place concrete per Subparagraph 3.05.A.1. and Subparagraph 3.05.A.5.b.
7) Test reports for concrete load tests for in-place concrete if required per Subparagraph 3.05.A.1.f and Subparagraph 3.05.A.5.b.2.b.

c. Certificates.
1) Batch Mixing Plant Certification per Subparagraph 1.07.C.1.a.
2) Curing Compound/Architectural Finish Bond Certification per Subparagraph 1.07.C.2.a.
3) Clear Curing and Sealing Compound Certification per Subparagraph 1.07.C.3.a.
4) Mix/Admixture Certification per Subparagraph 1.07.C.4.a.

d. Manufacturers' Instructions.
1) Concrete material and accessories installation instructions per Subparagraph 1.04.D.2.
2) Submit a letter from the curing compound manufacturer that specifies the coverage rate necessary to meet the restriction for loss of water per Subparagraph 2.01.J.1.c.1.a.1.

e. Manufacturers Field Reports.
1) Concrete delivery tickets per Subparagraph 1.08.A.1.c.

1.6 DEFINITIONS

A. Cementitious Material: A mixture of cement and ground granulated blast-furnace slag.

B. VOC: An acronym for volatile organic compounds, generally meant to refer to organic chemical compounds that have high enough vapor pressures under normal conditions to significantly vaporize and enter the atmosphere.

1.7 GENERAL DESIGN AND FABRICATION REQUIREMENTS

A. American Concrete Institute (ACI) Compliance:
1. Provide cast-in-place concrete work conforming to the requirements of ACI 301 except as modified by the Specifications and Contract Drawings.

B. Concrete Mix Design Properties:
1. Design concrete mixes to provide the following properties for the classes listed:
a. Minimum compressive strength of 4,000 psi at 28 days, and a minimum cementitious material content of 564 pounds per cubic yard.

C. Concrete Admixtures:
1. Only provide non-corrosive, non-chloride concrete admixtures.

D. Product Data and Installation Instructions:
   1. Submit the manufacturer's descriptive product data and current specifications for the concrete materials and accessories specified in this Section.
   2. Submit manufacturer's installation instructions for the concrete materials and accessories specified in this Section.

1.8 PERFORMANCE REQUIREMENTS

A. Requirements for Acceptance:
   1. Concrete Compressive Strength:
      a. If concrete fails to meet the minimum specified compressive strength test requirements, the concrete represented by such tests will be considered questionable and subject to further testing and other requirements as follows:
         1) Additional curing may be required as directed by the Engineer.
         2) Modifications may be required for remaining concrete work, including changes in the concrete mix designs.
         3) When the strength of the structure is considered potentially deficient by the Owner and/or the Engineer, structural analysis and/or additional testing may be required.
            a) If in the opinion of the Owner and/or the Engineer there is cause for concern over the adequacy of the structure regardless of the results of any previous tests, additional tests of the hardened concrete may be required.
               (1) Conduct the additional testing of questionable concrete in accordance with the requirements of ASTM C 42/C 42M at no increase in Contract Price, except as noted in Subparagraph 1.05.A.1.a.3.a.2.
               (2) If the initial test acceptance requirements had been met, the Contractoris not required to bear the costs of such additional tests unless their results confirm that the concrete in place is deficient.
            b) If concrete work is judged inadequate by the Engineer based on structural analysis or by results of a load test, reinforce it with additional construction if so directed by the Engineer or Owner, or replace it at no increase in Contract Price.
   2. Concrete Appearance:
      a. Repair defects which adversely affect the appearance of the specified finish in concrete exposed to view if possible.
         1) If in the opinion of the Engineer the defect cannot be repaired, the concrete may be accepted or rejected as provided in this Section.
         2) Concrete not exposed to view is not subject to rejection for defective appearance.
   3. Location of Members:
      a. Concrete members cast in the wrong location may be rejected if the strength, appearance, or function of the structure is adversely affected; or if the misplaced items interfere with other construction.
   4. Dimensional Tolerances:
      a. Inaccurately formed concrete surfaces which are exposed to view and exceed the requirements of ACI 117/117R may be rejected.
         1) Repair, or remove and replace, the section if required.
         2) If the outlines of formed concrete surfaces are smaller than required by an amount exceeding the requirements of ACI 117/117R, they will be considered deficient in strength and subject to the provisions of Subparagraph 1.05.A.1.

3) If the outlines of formed concrete surfaces are larger than required by an amount exceeding the requirements of ACI 117/117R, they may be rejected.
   a) The Engineer may require that the excess material be removed.
   b) If the excess material is to be removed, do so in a manner that maintains the strength of the section and meets the other applicable requirements of function and appearance.

b. Finished flatwork exceeding the allowable tolerances may be repaired provided that the strength or appearance of the flatwork is not adversely affected.
   1) Remove high spots with a terrazzo grinder.
   2) Fill in low spots with an approved patching compound.
   3) Perform other remedial measures as permitted by the Engineer.

B. Concrete Acceptance:
1. Completed concrete work which meets the specified requirements will be accepted without qualification.
2. The Engineer will determine the extent and manner of actions to be taken to correct defective concrete revealed by surface defects or otherwise.
   a. Prior to repairing defects, submit proposed materials and repair methods to the Engineer for approval.
   b. Obtain approval from the Engineer before performing repair work other than removing imperfect texture and filling pin holes and insert holes.
3. Completed concrete work which fails to meet one or more requirements but which has been repaired to be in compliance will be accepted without qualification.
   a. Repairs must be made at no increase in the Contract Price.
4. Completed concrete work which fails to meet one or more requirements and which cannot be brought into compliance may be accepted or rejected as provided in this Section.
   a. The Owner and the Engineer reserve the right to reject any or all items which do not meet the requirements of the Contract Drawings and Specifications.
   b. Repairs and additional testing and/or analysis must be performed at no increase in the Contract Price unless otherwise noted.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Acceptance at Site:
1. Delivery Tickets:
   a. Each load of concrete from the batch plant must be accompanied by a delivery ticket.
   b. Each delivery ticket must be signed by the Contractor's representative, and be annotated with the time and place of concrete pours using the concrete from the load represented by the delivery ticket.
   c. Keep the original delivery tickets as a record at the Work Site, and submit copies to the Engineer for information.
      1) Make delivery tickets available for inspection upon request by the Engineer.
   d. Include the tabulation described by ASTM C 94/C 94M as well as any additional information the local codes may require on the delivery ticket.

B. Storage and Protection:
1. Store the concrete admixtures in a manner that prevents contamination, evaporation, moisture penetration, and damage.
2. Do not use concrete admixtures that have been stored longer than 6 months.

1.10 PROJECT CONDITIONS

A. Project Environmental Requirements:
   1. Cold Weather Concreting:
      a. Perform cold weather concrete work in accordance with the requirements of ACI 306R and the following additional requirements:
         1) The temperatures of the subbase and other surfaces that come in contact with concrete must be above freezing.
            a) The subbase and surfaces of concrete forms must be free of snow and ice.
            b) Do not place concrete around any embedment which has a temperature below freezing.
         2) Provide equipment for heating and protecting concrete and concrete materials during freezing or near-freezing weather.
            a) Do not use foreign materials or materials containing snow or ice.
   2. Hot Weather Concreting:
      a. Perform hot weather concrete work in accordance with the requirements of ACI 305R and the following additional requirements:
         1) Do not deliver concrete having a temperature exceeding 90 degrees Fahrenheit to the Work Site.
         2) Cool the mix's ingredients before mixing to prevent the temperature of the mix from exceeding 90 degrees Fahrenheit.
            a) Furnish windbreaks, shading, fog spraying, sprinkling, or wet covering when necessary.

1.11 SCHEDULING

A. A minimum of 10 days prior to placing concrete, submit a schedule to the Engineer showing proposed construction methods, construction joint locations, and the sequence of pouring.

B. Before concrete is to be placed, give five days' notice to those performing other construction work related to the concrete pours, such as to those performing work that must be supported by or embedded in concrete, to allow embedded items to be introduced or furnished before the concrete is placed.

C. When placing concrete in walls and slabs, allow at least two days elapsed time for slabs and five days elapsed time for walls before concrete is placed against an adjacent vertical joints.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cement:
   1. Provide Portland cement conforming to the requirements for Type I, Normal, cement specified in ASTM C 150, except for concrete exposed to water, wastewater, or hydrogen sulfide gas.
   2. For concrete exposed to water, wastewater, or hydrogen sulfide gas, provide Portland cement conforming to the requirements for Type II, Moderate Sulfate Resistance, cement specified in ASTM C 150.
   3. Use cementitious material to determine the water/cementitious (W/C) ratio for cement.
   4. For exposed concrete, provide only one approved brand and manufacturer of cement.

B. Normal Weight Concrete Aggregate:
   1. Provide processed aggregate meeting the requirements of ASTM C 33.
   2. Coarse Aggregate Size:
      a. Within the following maximum size limitations, but in no case larger than 1 1/2 inches:
         1) One-fifth or less of the narrowest dimension between the sides of the forms within which the concrete is to be cast.
         2) Three-fourths or less of the minimum clear spacing between reinforcing bars.
         3) One-third or less of the slab thickness for unreinforced slabs.
      b. For use in metal pan stairs only, provide reduced aggregate concrete containing aggregate with a particle size not less than 1/8 inch or more than 1/2 inch in any dimension, and containing a maximum of 5 percent of particles passing a No. 8 sieve.

C. Water:
   1. Provide water clean and free of injurious amounts of oils, acids, alkalis, salts, organic materials, and other substances that may be deleterious to concrete or concrete reinforcement.

D. Concrete Admixtures:
   1. Admixture Manufacturers:
      a. Provide admixtures produced and serviced by established, reputable manufacturers.
   2. Air-Entraining Admixture:
      a. Provide a product conforming to requirements of ASTM C 260.
   3. Water-Reducing Admixture:
      a. For all concrete except where an admixture listed below is used, provide a product conforming to the requirements specified for Type A in ASTM C 494/C 494M.
      b. Manufacturers:
         1) The Euclid Chemical Company, Eucon WR-75, www.euclidchemical.com.
         2) BASF Admixtures, Inc., Pozzolith 220N, www.basf-admixtures.com.
         3) Sika Corporation, Plastocrete 161, www.sikaconstruction.com.
         4) Approved equal.
   4. Water-Reducing and Retarding Admixture:
      a. Provide a product conforming to the requirements specified for Type D in ASTM C 494/C 494M.
      b. Manufacturers:
         1) The Euclid Chemical Company, Eucon Retarder-75, www.euclidchemical.com.
         2) BASF Admixtures, Inc., Pozzolith 100XR, www.basf-admixtures.com.
         3) Sika Corporation, Plastiment, www.sikaconstruction.com.
         4) Approved equal.
   5. Water-Reducing and Acceleration Admixture:
      a. Provide a product conforming to the requirements specified for Types C or E in ASTM C 494/C 494M.
      b. Manufacturers:
         1) The Euclid Chemical Company, Accelguard 80, www.euclidchemical.com.
         2) BASF Admixtures, Inc., Pozzutec 20, www.basf-admixtures.com.
         3) Sika Corporation, Plastocrete 161 FL, www.sikaconstruction.com.
         4) Approved equal.
   6. High-Range, Water-Reducing Admixture:
      a. Provide a product conforming to the requirements specified for Type F in ASTM C 494/C 494M.
      b. Manufacturers:
         1) The Euclid Chemical Company, Eucon 1037, www.euclidchemical.com.
         2) BASF Admixtures, Inc., Pozzolith 400N, www.basf-admixtures.com.

3) Sika Corporation, Sikament 2000, www.sikaconstruction.com.
4) Approved equal.

E. Preformed Expansion Joint Fillers:
1. Nonextruding and Resilient Bituminous Types:
a. Provide nonextruding and resilient bituminous types of joint fillers for exterior use in pavements and sidewalks only.
b. Provide nonextruding and resilient bituminous joint fillers conforming to the requirements of ASTM D 1751.
2. Manufacturers:
a. The Euclid Chemical Company/Tamms Industries, Inc., www.euclidchemical.com.
b. W. R. Meadows, Inc., www.wrmeadows.com.
c. APS Supply Company, http://apscork.com.
d. Approved equal.

F. Vinyl Waterstops:
1. Provide ribbed type waterstops conforming to the requirements of COE CRD C 572, and manufactured from virgin polyvinyl chloride plastic compound.
2. Construction Joints:
a. Provide flat ribbed 6-inch by 3/8-inch construction joints, such as Catalog Number R6-38 manufactured by Vinylex Corporation, www.vinylex.com; or approved equal.
3. Expansion Joints:
a. Provide 9-inch by 3/8-inch; ribbed expansion joints with a 1½-inch outside diameter center bulb, such as Catalog Number RLB9-38 manufactured by Vinylex Corporation, www.vinylex.com; or approved equal.
4. Retro-fit Waterstops:
a. Provide 6-inch by 3/8-inch retro-fit vinyl waterstops with a 3 3/16-inch T-leg, such as Product Number 609 manufactured by Greenstreak, Inc., www.greenstreak.com; or approved equal.
5. Manufacturers:
a. Vinylex Corporation, catalog numbers as specified above, www.vinylex.com.
b. The Euclid Chemical Company/Tamms Industries, Inc., www.euclidchemical.com.
c. W. R. Meadows, Inc., www.wrmeadows.com.
d. Approved equal.

G. Curing Materials:
1. Provide curing materials that will not stain or affect the concrete finish, or lessen the concrete strength.
a. Burlap:
1) Provide burlap materials conforming to the requirements of AASHTO M 182.
b. Sheet Materials:
1) Provide sheet materials conforming to the requirements of ASTM C 171.
c. Liquid Membrane-Forming Curing Compound:
1) Provide liquid membrane-forming curing compound material conforming to the requirements for Type 1 specified in ASTM C 309.
a) Provide a compound that restricts the loss of water to not more than 0.039 gallons per cubic centimeter of surface in 72 hours when tested in accordance with ASTM C 156 at the coverage rate recommended by the manufacturer.
(1) Submit a letter from the manufacturer that specifies the coverage rate necessary to meet this restriction for loss of water.

b) Provide liquid membrane-forming curing compounds which are nontoxic, free of taste and odor, and comply with the low volatile organic compound (VOC) requirements of the U.S. Environmental Agency.

2) Manufacturers:
   a) L&M Construction Chemicals, Inc., L&M Cure, www.lmcc.com.
   b) BASF Admixtures, Inc.., Masterkure 200W, www.basf- admixtures.com.
   c) Euclid Chemical Company, Kurez DR, www.euclidchemical.com.
   d) Approved equal.

H. Clear Curing and Sealing Compound:
1. Provide a liquid-type membrane-forming clear curing and sealing compound conforming to the requirements for Type I, Class A, specified in ASTM C 1315.
2. Provide material that has a maximum volatile organic compound (VOC) rating of 350 grams per liter.
3. Provide material that has a moisture loss not more than 0.40 kilograms per square meter when applied at an application rate of 300 square feet per gallon.
4. Manufacturers:
   a. Euclid Chemical Co., Super Diamond clear VOX, www.euclidchemical.com.
   b. BASF Admixtures, Inc., Sonneborn®, Kure-N-Seal 25LV, www.chemrex.com.
   c. L&M Construction Chemical, Inc., Lumiseal WB Plus, www.lmcc.com.
   d. Approved equal.

I. Non-Slip (Dry-Shake) Aggregate Surfacer:
1. Provide aluminum-oxide, non-slip aggregate surfacer to be applied to fresh concrete by the dry-shake method.
2. Manufacturers:
   a. Sonneborn; Frictex, www.chemrex.com.
   b. Approved equal.

J. Epoxy Bonding Compound:
1. Provide a high-modulus, low-viscosity, moisture-insensitive epoxy adhesive conforming to the requirements for Type II, Grade 2, Classes B and C, specified in ASTM C 881 when mixed, and having the following properties:
   a. Compressive Strength (Minimum): 8,000 psi at 28 days when measured in accordance with the requirements of ASTM D 695.
   b. Tensile Properties:
      1) Tensile Strength (Minimum): 4,000 psi at 14 days when measured in accordance with the requirements of ASTM D 638.
      2) Elongation at Break: One to three percent when measured in accordance with the requirements of ASTM D 638.
      3) Modulus of Elasticity: 3 x 105 psi when measured in accordance with the requirements of ASTM D 638.
   c. Minimum Bond Strength (Plastic Concrete to Hardened Concrete): 1,700 psi at 14 days (moist cure) when measured in accordance with the requirements of ASTM C 882.
2. Manufacturers:
   a. Sika Corporation; Sikadur 32 Hi-Mod, www.sikaconstruction.com.
   b. Euclid Chemical Company; Euco Epoxy #452 MV or #620, www.euclidchemical.com.
   c. Fosroc, Inc.; Notobond 881, www.studiolina.com/studio/websites/fosroc.
   d. Approved equal.

K. Epoxy Adhesive (For Grouting Dowels):

1. Provide a high-modulus, moisture insensitive epoxy adhesive of thick (gel) consistency conforming to the requirements for Type I, Grade 3, Classes B and C, specified in ASTM C 881, and having the following properties:
   a. Compressive Strength (Minimum): 10,000 psi at 28 days when measured in accordance with the requirements of ASTM D 695.
   b. Tensile Properties:
      1) Tensile Strength (Minimum): 3,000 psi at 14 days when measured in accordance with the requirements of ASTM D 638.
   c. Minimum Bond Strength (Hardened Concrete to Hardened Concrete): 2,000 psi at 14 days (moist cure) when measured in accordance with the requirements of ASTM C 882.
2. Manufacturers:
   a. Sika Corporation; Sikadur 31 Hi-Mod Gel, www.sikaconstruction.com.
   b. Euclid Chemical Company, Euco Epoxy #452 Gel or #620 Gel, www.euclidchemical.com.
   c. Fosroc, Inc.; Anchorbond, www.studiolina.com/studio/websites/fosroc.
   d. Approved equal.

L. Dovetail Anchor Slots:
1. Provide 24 gauge-galvanized steel, foam filled dovetail anchor slots.

M. Construction Joint Devices:
1. Provide integral, galvanized steel construction joint devices formed to make a tongue and groove profile.
   a. For exposed concrete areas, provide plastic joint cap strips that can be removed to allow placement of sealant.
2. Manufacturers:
   a. Meadowburke, www.meadowburke.com.
   b. Heckmann Building Products, Inc., www.heckmannbuildingprods.com.
   c. Approved equal.

N. Contraction Joint Inserts:
1. Provide two-piece, plastic, preassembled, preformed contraction joints with a depth of embedment equal to 1/4 of the slab thickness.
2. Manufacturers:
   a. Meadowburke, Burke Zip Strip, www.meadowburke.com.
   b. W.R. Meadows, Speed - E - Joint., www.wrmeadows.com.
   c. Approved equal.

O. Construction and Control Joint Filler (For Slabs-on-Grade):
1. Provide two-component epoxy construction and control joint fillers.
2. Manufacturers:
   a. Sika Corporation, Sikadur 51 SL, www.sikaconstruction.com.
   b. Euclid Chemical Company, Euro 700, www.euclidchemical.com.
   c. BASF Admixtures, Inc., Masterfill 300, www.basf-admixtures.com..
   d. Approved equal.

2.2 EQUIPMENT

A. Furnish plant equipment and facilities conforming to the requirements specified in the NRMCA Plant Certification Checklist - Section 3 for producing the ready-mixed concrete.

2.3 MIXES

A. Design Mix:
1. Prior to producing concrete, submit all mix designs proposed for Contract to the Engineer for approval on form attached at the end of this Section.
   a. Include a standard deviation analysis or laboratory trial mixture test data with the submittal in accordance with Section 4 of ACI 301.
   b. Use materials in proposed design mixes as specified in this Section.
   c. Make adjustments in the proposed design mix as directed by the Engineer at no increase in the Contract Price.
2. Do not add water to concrete mixes at the Work Site unless it is withheld from the mix at the batch mixing plant.
   a. Indicate the amounts of mix water to be withheld for later addition at the Work Site in the approval form.

B. Proportions of Ingredients:
1. Select the proportion of normal weight concrete in the mix in accordance with the requirements of ACI 211.1.
2. Establish proportions of ingredients of the mix, including the water-cement ratio, on the basis of either laboratory trial mixture tests or standard deviation analysis, using the materials specified within this Section.
   a. Perform the Laboratory Trial Mixture Test in accordance with Section 4 in ACI 301.
   b. Perform the Standard Deviation Analysis in accordance with Section 4 in ACI 301.

C. Water-Cement Ratio:
1. Provide a maximum water-cement ratio of 0.45.

D. Slump:
1. Proportion and produce concrete to produce a slump as indicated in Table 03300-1.

Table 03300-1 Concrete Slump Requirements

Type of Construction	Slump (Inches)	
	Maximum1	Minimum
Slabs	4	1
Building columns, piers	4	1
Pavements and slabs-on-grade	3	1

2. For pumped concrete, use concrete having a maximum slump measured prior to pumping of 5 inches.
3. For concrete containing high-range water-reducing admixtures, the maximum allowable slump after the admixture is added to concrete with an initial slump of 2 to 4 inches is 8 inches.

E. Admixtures:
1. Comply with the manufacturer's recommendations when using concrete admixtures.
2. Air Entraining Admixture:
   a. Provide air-entrained concrete for each concrete pour unless indicated otherwise in the Specifications or on the Contract Drawings.
      1) Do not air-entrain concrete for interior floor slabs.
   b. The total air content required is as indicated in Table 03300-2:

Table 03300-2 Air Content

Maximum Coarse Aggregate Size (Inches)	Air Content (Percent by Volume)
1 1/2	5 ± 1
3/4 or 1	6 ± 1

3. Water-Reducing Admixture:
   a. Unless high temperatures occur or placing conditions dictate a change, provide concrete containing a water-reducing admixture.
4. Water-Reducing and Retarding Admixture:
   a. When high temperatures occur or placing conditions dictate, the water- reducing admixture (Type A) may be replaced with a water-reducing and retarding admixture (Type D).
      1) Notify the Engineer of this change, and submit product data for the water-reducing and retarding admixture prior to placing the modified concrete.
5. Water-Reducing and Accelerating Admixture:
   a. When low temperatures occur or placing conditions dictate, the water- reducing admixture (Type A) can be replaced with a water-reducing and accelerating admixture
      1) Notify the Engineer of this change, and submit product data for the water-reducing and accelerating admixture prior to placing the modified concrete.

2.4 FINISHES

A. Concrete Surface Irregularities:
   1. Allowable surface irregularities in concrete finishes are designated as either "abrupt" or "gradual" in this Section.
      a. Furnish 10-foot straightedges to check gradual irregularities in concrete finishes.

B. Formed Surface Finishes:
   1. Apply one or more of the following finishes to the surfaces of formed concrete after removing the forms:
      a. Rough Form Finish:
         1) The surface of the formed concrete may not include roughness and irregularities exceeding 1/2 inch.
         2) Patch tie holes and defects.
      b. Ordinary Wall Finish:
         1) The surface of the formed concrete must be true and uniform without any conspicuous offsets or bulges.
         2) Gradual irregularities may not exceed 1/2 inch, and abrupt irregularities may not exceed 1/4 inch.
      c. Plywood Finish:
         1) The surface must comply with the requirements for the Ordinary Wall Finish, except gradual irregularities exceeding 1/2 inch and abrupt irregularities exceeding 1/8 inch must be removed.
            a) Completely remove all fins on the surface.
            b) Rub the surfaces which cannot meet these requirements as specified in Subparagraph 2.04.B.1.d.
         2) Construct the surface of the forms using 5/8-inch plywood or boards lined with tempered hardboard not less than 3/16 inch thick.
         3) Place the plywood or liner sheets in an orderly and symmetrical arrangement using sheets as large as practicable.

4) Do not use sheets showing torn grain, worn edges, patched holes from previous use, or other defects which will impair the texture of the concrete surfaces.

C. Unformed Surface Finishes:
1. Apply one or more of the following finishes to the surfaces of unformed concrete:
a. Floated Finish:
1) After the concrete has been placed, consolidated, struck off, and leveled, do no further work until the concrete is ready for the floating operation.
2) Begin a floating operation when the water sheen has disappeared and the surface of the concrete has stiffened sufficiently to permit the operation.
a) During or after the first floating, check the planeness of surface by laying a straightedge on top of the concrete surface at not less than two different angles.
b) During this procedure, cut down high spots and fill low spots to produce a surface with true planes within 1/4 inch in ten feet as determined by placing a ten foot straightedge anywhere on the slab in any direction.
c) Immediately following checking the surface with the straightedge, re-float the slab to a uniform texture.
b. Steel Trowel Finish:
1) This finish is applied immediately to a fresh Floated Finish by working the floated finish with a steel trowel.
a) Perform the first troweling to produce a smooth surface which is relatively free of defects, but which may still show some trowel marks.
b) Perform additional trowelings by hand after the surface has hardened sufficiently.
c) Perform the final troweling when a ringing sound is produced as the trowel is moved over the surface.
2) Thoroughly consolidate the surface by hand trowel operations to produce a finished surface essentially free of trowel marks, uniform in texture and appearance, and with true planes within 1/4 inch in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.
c. Broom or Belt Finish:
1) This finish is applied immediately to a fresh Floated Finish by drawing a broom or burlap across the surface to give the surface a coarse transverse scored texture.
d. Nonslip Finish:
1) Apply non-slip aggregate surfacer to the surfaces using the "dry shake" method of application.
2) Apply the non-slip aggregate surfacer in accordance with manufacturer's recommendations and at a rate not less than 25 pounds per 100 square feet.

2.5 SOURCE QUALITY CONTROL

A. Tests:
1. Materials specified in this Section require advance examination or laboratory testing according to the methods referenced herein, or as required by the Engineer.
a. Submit concrete test reports for the testing specified in this Section.
2. Compression Test:
a. For laboratory trial batches of concrete, make compression test cylinders in accordance with ACI 301.

b. Test four compression test cylinders for each class of concrete, breaking two at seven days and breaking two more at 28 days per the requirements of ASTM C 192/C 192M and ASTM C 39/C 39M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect the locations that will receive cast-in-place concrete for deficiencies which would prevent proper execution of the concrete work.
   1. Do not proceed with concrete placement until deficiencies discovered by the inspection are corrected to the satisfaction of the Engineer.

3.2 PREPARATION

A. Prepare formwork in advance in accordance with the requirements of Section 03 10 00, Concrete Forms and Accessories; and remove snow, ice, water, and debris from within forms.

B. Pre-position reinforcement in accordance with the requirements of Section 03 20 00, Concrete Reinforcement; in advance of concrete pours.

C. Sprinkle the subgrade sufficiently to eliminate water loss from concrete in accordance with ACI 302.1R.
   1. Verify that the subgrade is moist, with no free water and no muddy or soft spots, before placing concrete.

D. Vapor Barrier:
   1. Immediately before pouring concrete floor slabs, place vapor barrier on their crushed stone bases under the imminent slab pours.
      a. Lap all vapor barrier sides 6 inches and vapor barrier ends 12 inches.
      b. Patch any holes and rips in the vapor barrier film to the satisfaction of the Engineer.
      c. At exterior walls, turn the vapor barrier up to the top of the slab.
   2. Coordinate vapor barrier placement with installation of the perimeter foundation insulation.

E. Embedded Pipes and Conduits:
   1. The Engineer may permit material that is not harmful to concrete to be embedded in the concrete if the following conditions are satisfied:
      a. The maximum outside dimension of an item to be embedded is not greater than one-third the overall thickness of the member in which it is to be embedded.
      b. The minimum spacing between items to be embedded is not less than 3 widths on center, or 3 inches clear between items, whichever is less.
      c. The item(s) to be embedded will not impair the strength of the concrete member.
      d. A 2-inch minimum clearance from the embedded item(s) to the face of the concrete slab is maintained.
      e. Items to be embedded are not made of aluminum.
      f. Concrete reinforcement within the concrete member will not be cut, bent, or displaced in order to embed the item(s).
   2. Anchor Rods:

a. Install anchor rods accurately, both vertically and horizontally, in the formwork as shown on the Contract Drawings.
b. Insure anchor rods are held firmly in the correct position and at the proper elevation by suitable templates during the placement of concrete.
c. Limit the variation in the locations of anchor rods and other embedded items from the dimensions shown on the Contract Drawings to within the tolerances listed in AISC 303.

F. Anchor Reinforcement Dowels into Existing Concrete.
1. Using a carbide tip bit or star bit, drill holes for each dowel to the size and depth indicated on the Contract Drawings.
a. Core drilling is not permitted.
b. Do not drill into, cut, or otherwise damage existing reinforcement bars.
1) If existing reinforcement bars are encountered during the drilling operation, relocate the hole to clear the existing reinforcement as directed by the Engineer.
2. Blow clean each finished hole with an oil free air jet, and then flush the hole with a jet of clean water.
3. Immediately prior to placing and grouting the dowel bar into the hole, remove all water from the hole and from the walls of the hole.
4. Mix and place epoxy adhesive completely around the dowel bar in the hole in strict accordance with the manufacturer's recommendations.
a. Pay particular attention to the manufacturer's specified time limit within which the material must be placed after mixing.
b. Do not re-temper grout that has begun to stiffen; discard such grout.

3.3 CONSTRUCTION

A. Construction of Concrete Elements:
1. Construct the concrete elements indicated on the Contract Drawings or in the Specifications; including but not limited to, beams, columns, slabs, foundations, in-ground encasement of piping and conduit, reaction backings for piping, concrete backfill, and the reinforced concrete bases for equipment and piping provided under this Contract.
2. Provide only Class A concrete to construct concrete elements for this Contract except where indicated otherwise on the Contract Drawings or in the Specifications.
a. For in-ground encasement of piping, provide Class B concrete.
1) Encase pipes in concrete that are under structures and buildings or that are indicated to be encased in concrete on the Contract Drawings for the full length of the pipe run under the structure and as indicated.
b. For in-ground encasement of conduit runs, provide Class B concrete.
1) Encase conduit runs indicated to be encased in concrete on the Contract Drawings as indicated and detailed on the Contract Drawings.
c. For reaction backings, provide Class B concrete.
d. For backfilling of over-excavated foundation area, foundation voids, and cavities, provide Class B concrete.

B. Concrete Production:
1. Batch, mix, and transport ready-mixed concrete in accordance with ASTM C 94/C 94M.
2. Add admixtures to the mix in accordance with ACI 301.

C. Conveying and Placing Concrete:

1. Maintain the required concrete quality by rapidly conveying the concrete from the mixer to the location of the placement, and by using methods which will prevent segregation and loss of ingredients.
    a. After introducing either the mixing water to the cement and aggregates, or the cement to the aggregates, complete discharging the concrete within 1 1/2 hours or before the mixing drum has revolved 300 revolutions; whichever comes first.
    b. Do not convey concrete through aluminum or aluminum alloy equipment.
2. If the concrete is to be conveyed and placed by pumping, conform to the applicable requirements of ACI 304R, Chapter 9, and ACI 304.2R.
    a. Do not place concrete by pumps or other similar devices without prior written approval of the Engineer.
3. Place concrete in accordance with the requirements of ACI 304R and the additional requirements specified in this Section.
    a. Do not drop concrete freely more than 4 feet or in areas where reinforcing will cause segregation.
    b. Deposit concrete in approximately horizontal layers 12 to 18 inches deep.
    c. Do not allow concrete to flow laterally more than three feet.
    d. Do not use concrete which has partially hardened, or has been contaminated by foreign materials.
        1) Place concrete at a rate so that the concrete which is being integrated with the fresh concrete is still plastic.
        2) Do not deposit concrete on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within sections.
    e. Do not place concrete in forms containing standing water.
    f. Do not bend reinforcement out of position when placing concrete.
    g. Within pour sections, continuously place concrete to produce a monolithic unit.
    h. Do not cast or erect beams, girders, or slabs supported by columns or walls until the concrete in the vertical support members is no longer plastic.
4. Consolidating Concrete:
    a. Consolidate concrete by vibration, spading, rodding or other manual methods.
        1) Work the concrete around the concrete reinforcement and embedded items, and into corners.
        2) Eliminate all air or stone pockets; and eliminate other causes of honeycombing, pitting, and planes of weakness.
        3) Use vibrators capable of transmitting vibrations to the concrete in frequencies sufficient to provide satisfactory consolidation.
            a) Use the internal type of vibration equipment, and not the type attached to forms or concrete reinforcement.
            b) Do not use vibrators to spread the concrete.
        4) Do not leave vibrators in one spot long enough to cause segregation.
    b. Keep sufficient vibration equipment in reserve on the Work Site to prevent a shutdown of the Work occasioned by a failure of the primary vibration equipment.

D. Joints:
1. Joint Locations:
    a. Only the locations of critical joints are indicated on the Contract Drawings.
        1) Subject to the Engineer’s approval, locate additional joints that are required in walls, slabs, and foundations throughout the structures.
            a) Submit requests for approval of additional joint locations to the Engineer ten days prior to scheduled concrete pours adjacent to the proposed joints.

b) Do not make concrete pours unless the joint locations have been approved by the Engineer.

b. If concreting is to be interrupted for more than 45 minutes, or long enough for the concrete to harden, form and construct a construction joint.

c. Locate the additional construction joints required in walls and foundations where they will least impair the strength of the structure.
   1) Do not locate construction joints in continuous grade beams and footings more than 60 feet apart horizontally.
   2) Do not locate construction joints in foundation slabs more than 30 feet apart horizontally.
   3) Do not locate construction joints in continuous walls more than 30 feet apart horizontally.
      a) At corners or other intersections of two or more walls, provide a construction joint in each wall in all directions that is less than 20 feet from the intersection point.
      b) Align construction joints in walls with the construction joints placed in the supporting foundation element (base slab, continuous footing, grade beam), or offset the construction joints a minimum of 5 feet.

d. Locate the additional construction joints required in elevated (suspended) formed slabs where they will least impair the strength of the structure.
   1) Locate joints within the center third of an elevated formed slab's span.
   2) Do not locate construction joints more than 30 feet apart in each direction in an elevated formed slab.
      a) Some minor deviation from this spacing may be approved by the Engineer to allow correction for column spacing and construction details.
   3) Continue the concrete reinforcement through the construction joints.
   4) Locate joints in girders with intersecting beams a minimum offset distance from the beam of two times the width of the beam.
   5) Do not cast or erect beams, girders, or slabs supported by columns or walls until the concrete in the vertical support member is no longer plastic.

e. Locate additional control joints and construction joints in slabs-on-grade at the following maximum spacing unless noted otherwise:
   1) In 5-inch slabs, space the joints 15 feet apart each way.
   2) In 6-inch slabs, space the joints 18 feet apart each way.
   3) In 8-inch slabs, space the joints 24 feet apart each way.

f. Install expansion joints and contraction joints where indicated on the Contract Drawings.

2. Construction Joints:
   a. Typically, construct construction joints before the initial hardening of the concrete can take place by forming keyways, installing PVC waterstops in the concrete if required, and embedding reinforcement dowels in the concrete extending a minimum of one splice length beyond the joint.
      1) Provide PVC waterstops in construction joints that will be exposed to liquids, are in contact with earth, or are exposed to the weather.
      2) If concrete placement is interrupted long enough for a "cold joint" (hardened surface) to form, install dowel so that one splice length will extend into the present concrete section pour, and one splice length will extend into the adjacent future pour.
         a) Size the embedded dowels to match the size of the concrete reinforcement in the slab, wall, or foundation being poured.

b) In elevated slabs, splice the dowels to the top and bottom concrete reinforcement.

b. Only use the "construction joint devices" in concrete that is not intended to retain water.

c. Horizontal construction joints are not permitted in slabs or footings.

3. Control Joints and Construction Joints in Slabs-On-Grade:
   a. Control joints can be constructed in a slab-on-grade by installing a "contraction joint insert" in the slab by pressing a straight edge cutting tool into the slab's wet concrete to part the aggregate.
      1) Place the insert into the separation until the top of the insert lays on the surface of the wet concrete.
      2) Remove the top section of the insert, and float the concrete to fill voids adjacent to the insert and finish the concrete surface.
   b. Control joints can also be constructed in a slab-on-grade by saw-cutting a continuous straight slot to a depth of one-fourth the thickness of the slab.
      1) Submit detailed procedures and plans to the Engineer for review and acceptance before constructing control joints.
      2) Saw the slot as soon as the concrete has hardened sufficiently; but complete the sawing within 12 hours after the concrete has been placed.
   c. Fill all construction and control joints in slabs-on-grade with construction and control joint filler.
4. Expansion Joints and Contraction Joints in Walls:
   a. Do not extend reinforcing or other embedded metal items through expansion and contraction joints except where indicated otherwise on the Contract Drawings.
   b. For expansion joints and contraction joints that will be exposed to liquids, are in contact with earth, or are exposed to the weather; provide PVC waterstops in the joints.
5. Bonding Hardened Concrete to New Concrete:
   a. Bond fresh new concrete to hardened previously poured concrete in accordance with the following:
      1) Roughen and clean the hardened concrete to remove foreign matter and laitance, and then dampen the hardened concrete with water.
      2) Cover the hardened concrete with a heavy, 1/2-inch thick, coating of grout.
         a) Provide grout having the same material composition and proportions as the concrete being poured, except omit the coarse aggregate.
         b) Provide grout with a slump of 6 inches, minimum.
      3) Place the new concrete on the grout before the grout has attained its initial set.
      4) Any other bonding methods must be approved by Engineer prior to use.
6. No exceptions to the specified requirements for joints are permitted unless written approval is given by the Engineer.

E. Finishing Concrete:
1. Whether the concrete is to remain natural concrete or will receive an additional applied finish or material, finish the concrete surfaces as indicated or scheduled on the Contract Drawings and as specified in this Section
   a. For concrete having unformed surfaces, use just enough mortar to avoid the need for excessive floating.
   b. Slope exposed unformed surfaces to provide quick, positive drainage; and to avoid puddles in low spots.
      1) Unless noted otherwise on the Contract Drawings, slope all unformed surfaces exposed to the weather 1/4 inch per foot for drainage.
2. Unless the type of finish is indicated on the Contract Drawings or is a Special Finish, finish concrete surfaces as follows.

a. Rough Form Finishes:
   1) Provide a Rough Form Finish on concrete surfaces to be covered by earth.
b. Ordinary Wall Finishes:
   1) Provide an Ordinary Wall Finish for the following:
      a) Interior and exterior concrete wall surfaces not exposed to view.
      b) The inside vertical concrete surfaces of tank type structures 18 inches or more below the normal water level.
      c) The interior concrete walls of water filter structures 6 inches or more below the filter media.
      d) The concrete walls and overhead surfaces of clear wells.
      e) The undersides of concrete slabs to be covered by architectural ceilings.
c. Plywood Finishes:
   1) Provide a Plywood Finish for all surfaces to be painted.
d. Rubbed Finishes:
   1) Provide a Rubbed Finish for the following:
      a) Interior and exterior concrete surfaces exposed to view which will not be painted.
      b) Exterior concrete surfaces above the level beginning 6 inches below finished ground.
      c) Concrete equipment pads.
      d) The inside vertical concrete surfaces of tank type structures above the elevation located 18 inches below the normal water level.
      e) The interior concrete walls of water filter structures above the level 6 inches below the filter media.
      f) Concrete pipe support bases.
e. Floated Finishes:
   1) Provide a Floated Finish for all unformed concrete surfaces unless otherwise specified.
f. Steel Trowel Finishes:
   1) Provide a Steel Trowel Finish for the following:
      a) The tops of exposed concrete walls.
g. Broom or Belt Finishes:
   1) Provide a Broom or Belt Finish for the following:
      a) Concrete traffic surfaces.
      b) Concrete sidewalks.
h. Non-slip Finishes:
   1) Provide a Non-slip Finish for exterior concrete stair treads and landings.

F. Curing Concrete:
1. Immediately after placing and finishing concrete, protect the concrete from premature drying, excessive hot or cold temperatures, and mechanical injury.
2. Cure the concrete by water curing, sheet form curing, or liquid membrane forming methods in accordance with ACI 308R.
   a. Cure concrete continuously for a minimum of 7 days at ambient temperatures above 40 degrees Fahrenheit.
      1) Cure the concrete during cold weather according to the requirements of Subparagraph 1.09.A.1.
      2) Cure the concrete during hot weather according to the requirements of Subparagraph 1.09.A.2.

b. Control the curing of concrete surfaces that will get a membrane coating, by using water fog spraying, water damped coverings, and/or an impermeable sheet film cover for the full 7-day period specified in Subparagraph 3.03.F.2.a.
   1) Do not apply the membrane until the concrete surfaces have cured a minimum of 28 days.
   2) Do not use liquid membrane- forming curing compounds on these surfaces.

c. If liquid curing compounds will be used to cure the concrete, complete finishing operations prior to applying the compound; and apply the compound as soon as the free water on the concrete surface disappears and no water sheen is visible.
   1) Do not use liquid curing compounds on concrete surfaces which will receive later treatments, such as hardeners, special finishes, protective coatings, damp proofing, waterproofing, future grout, grout fill, or other coatings.
   2) Do not use liquid curing compound when the ambient air temperature during placement and for 24 hours after placement is or will fall below 35 degrees Fahrenheit.
   3) The surface must be capable of having workers walk on it without marring the surface.
   4) Apply the liquid curing compound twice.
      a) Do not apply liquid curing compound to the surfaces of construction joints.
      b) Protect exposed reinforcement during application of curing compound.
      c) Water cure those areas not coated with liquid curing compound.

3. Note that concrete containing ground granulated blast furnace slag may require a longer time to set compared to 100 percent Portland cement concrete.
4. Protect the finished surfaces and slabs from the direct rays of the sun to prevent checking and crazing.

3.4 REPAIR/RESTORATION

A. Remove concrete segregated into ingredients during consolidation by vibrator operations, and replace the segregated concrete with new concrete.

B. As soon as the forms have been stripped from the concrete and the concrete surfaces have been exposed, do the following:
   1. Remove fins and other projections, fill recesses left by the removal of form ties, and repair surface defects which do not impair the structural strength of the concrete.
   2. Clean all exposed concrete surfaces and adjoining areas stained by the leakage of concrete to the satisfaction of the Engineer.

C. Repair tie holes and other small cavities by cleaning out the resulting cavities, wetting the cavity area, and then filling the cavity with a stiff mortar of the same material used in the concrete, but somewhat leaner.

D. Repair and patch other defective areas with cement mortar of mix proportions and materials identical to those used in the surrounding concrete.
   1. Produce a finish on the patch that is indistinguishable from the surrounding concrete.

E. Where honeycomb or voids are not excessive, and repairs are authorized by the Engineer; saw cut a 1/2 to 3/4 inch deep square outline around the area of defective concrete to be removed and patched, and chip out the defective concrete inside the outline to a depth not less than 2-inches until sound solid concrete is encountered.

1. If chipping is necessary, make the edges of the depression perpendicular to the concrete surface or slightly undercut to provide a key at the edge of the patch.
2. Thoroughly clean, dampen, and brush coat the area to be patched with neat cement grout; and follow this preparation by placing a cement mortar to patch the concrete.
   a. Other patching materials may be used if accepted by Engineer in writing prior to start of repair work.
3. Keep the patch damp for 7 days at a temperature above 50 degrees Fahrenheit.

3.5 FIELD QUALITY CONTROL

A. Site Tests:
1. During the period when concrete is being placed, must perform routine and other testing of materials at no additional cost to the Agency.
   a. Advise the Testing and Inspection Agency sufficiently in advance of operations to allow testing personnel to be assigned and to provide sufficient time for quality tests to be performed and completed.
   b. Provide and maintain adequate and separate facilities for safe storage and proper curing of concrete test cylinders on the Work Site for the sole use of the Testing and Inspection Agency.
   c. Provide containers for transporting concrete test cylinders to the testing laboratory.
   d. The Testing and Inspection Agency must perform additional materials testing due to changes in materials or proportions requested by the Contractor or testing required by failure of material to meet specified requirements.
   e. Failure of Testing and Inspection Agency to detect defective work will not prevent its rejection later when the defect is discovered, neither does it obligate the Engineer or Owner to grant final acceptance of the Work.
   f. Submit the test results of the following field quality control testing to the Engineer for information.
2. Concrete Slump Test:
   a. Test Procedure:
      1) Determine the slump of a concrete Sample from each truckload of concrete upon its arrival at the Work Site, and from other concrete whenever the consistency of the concrete appears to vary.
      2) Determine the temperature of the concrete Sample.
      3) Determine the slump according to the requirements of ASTM C 143/C 143M.
   b. Acceptance Criteria:
      1) Refer to Paragraph 2.03.D.
3. Air Content Test:
   a. Test Procedure:
      1) Determine the air content of the concrete on a regular and frequent basis in accordance with ASTM C 231, ASTM C 173/C 173M, or ASTM C 138/C 138M.
   b. Acceptance Criteria:
      1) Refer to Subparagraph 2.03.E.2.b.
4. Concrete Strength Test for New Concrete:
   a. To evaluate the potential strength and uniformity of new concrete, perform at least five strength tests for each specified mix design to represent the mix's strength.
   b. Test Procedure:
      1) Secure composite samples in accordance with ASTM C 172.

a) Obtain representative test samples from different batches of concrete on a truly random basis by selecting a test batch number at random before commencing the placement of concrete.
b) When pumping or pneumatic equipment is used, obtain samples at the truck and discharge ends.
c) Take sufficient test samples to perform not less than 5 strength tests of two 28 day cylinders per test for each concrete mix design.
(1) Take samples for each concrete mix design not less than once a day, or not less than once for each 100 cubic yards of concrete, or not less than once for each 3000 square feet of surface area placed.

2) Mold at least 4 concrete test cylinders in strict compliance with the requirements of ASTM C 31/C 31M for each strength test, and cure the cylinders for a 24-hour initial curing period.
a) Have a responsible representative from the Quality Assurance Testing and Inspection Agency observe the making of the concrete test cylinders by the Contractor, and immediately thereafter pack them in a sturdy container that was furnished by the Contractor and approved by the Quality Assurance Testing and Inspection Agency.
b) Surround the concrete test cylinders with wet sand or sawdust and protect them from freezing.
c) Sequentially number the concrete test cylinders and record the number, the date each cylinder was made, and the results of the slump test and the temperature for each sample on the proper form; forward the form to the Engineer, and then transport the cylinders to the testing laboratory where they will be cured in strict compliance with ASTM C 31/C 31M until the time of the test.

3) Conduct each strength test in accordance with ASTM C 39/C 39M as follows:
a) Test 2 concrete test cylinders from the same sample 7 days after the cylinders were made for information.
b) Test 2 additional concrete test cylinders from the same sample 28 days after the cylinders were made for acceptance.
c) Average the compressive strengths of the two specimen cylinders tested at 28 days.
d) If one concrete test cylinder in a strength test manifests evidence of improper sampling, molding, or testing, discard it and consider the strength of the remaining cylinder to be the test result; if both specimen cylinders in a test for a single sample show any of the above defects, discard the entire test for that sample.

c. Acceptance Criteria:
1) Evaluate the test results for standard molded and cured test cylinders separately for each specified concrete mix design by comparing the test results to the minimum requirements for the Class of concrete as specified in Subparagraph 1.04.B.1.
2) The strength level of the concrete will be considered satisfactory so long as the average of all sets of three consecutive compressive strength test results equal or exceed the specified strength f'c, and no individual strength test result falls below the specified strength f'c by more than 500 psi.

5. Concrete Strength Test for Concrete in Place:
a. The Engineer will determine locations where the concrete in place is potentially deficient, and where to obtain test cores to least impair the structure's strength.

1) As an aid to evaluate in place concrete strength or for selecting areas to be cored, the Engineer may permit concrete-in-place to be tested by impact hammer, sonoscope, or other nondestructive device to determine the relative strengths at various locations in the structure.
2) Preliminary tests of concrete-in-place will not be used as a basis for accepting or rejecting the concrete, but the core testing will be the basis for accepting or rejecting the in-place concrete.

b. Concrete Core Test:
1) Test Procedure:
a) The Engineer will determine the locations in each member or area of concrete in place where the required cores may be obtained.
b) Where required, take at least three representative core samples, each at least 2-inches in diameter, from each member or area of concrete in place that is considered potentially deficient.
(1) If the concrete in the structure will be dry under service conditions, air dry the cores for 7 days before the test at a temperature of 60 to 80 degrees Fahrenheit and a relative humidity of less than 60 percent; and test the cores dry.
(2) If the concrete in the structure will be more than superficially wet under service conditions, the cores test the cores after moisture conditioning them in accordance with ASTM C 42/C 42M.
c) Test the core samples in accordance with ASTM C 42/C 42M.
(1) If one or more of the cores shows evidence of having been damaged before the testing, replace it either subsequent to or during its removal from the structure.
d) Solidly fill core holes with low slump concrete.
2) Acceptance Criteria:
a) Concrete in the area represented by a core test will be considered adequate if the average compressive strength of the cores is equal to at least 85 percent of the specified strength f'c, and if no single core is less than 75 percent of the specified strength f'c.
b) If the core tests fail to demonstrate concrete strengths adequate for the intended purpose of the member or members in question, or are inconclusive or impractical to obtain, or if structural analysis does not confirm the safety of the structure, load tests may be required.
(1) Evaluate the results in accordance with ACI 318/318R.

END OF SECTION

FINAL CONCRETE MIX DESIGN SUBMITTAL FORM
(One for each required mix design)

PROJECT:_____ Location: _____
General Contractor:
Mix design no.:_____ Design strength: _____

USE:(Describe): _____
Mix Design Preparation: Based on Standard Deviation Analysis: _____
(check one) or Based on Trial Mixture Test Data: _____

MATERIALS:

Aggregates: (Provide size, type, source, specification)
Coarse: _____
Fine: _____

Cement Type/Source: _____

Admixtures: (Provide product, manufacturer)
Water Reducer (WR): _____
Air Entraining (AE): _____
Accelerator: _____
Other: _____

CONCRETE PROPERTIES

Water/Cement Ratio: _____
Slump:_____inches
Entrained Air:_____%
Density_____pcf

SPECIFIC GRAVITIES

Fine Aggregate: _____
Coarse Aggregate: _____

ADMIXTURES

Accelerator_____oz. per 100# cement
W. R._____oz. per 100# cement
A. E._____oz. per 100# cement
Other_____oz. per 100# cement

MIX PROPORTIONS

	Weight (lbs)	Absolute Volume (cubic feet)
Cement:		
Fine Aggregate:		
Coarse Aggregate:		
Water:		
Entrained Air:		
Other:		
TOTAL		

TEST RESULTS SUBMITTAL FORM

METHOD 1 - STANDARD DEVIATION ANALYSIS (ACI 318/318R, ACI 301):

Number of Test Cylinders Evaluated:_____ Standard Deviation: _____
(Attach Copy of All Test Results)
Mix Designs Proportioned to Achieve Both of the Following:

f'cr = f'c + 1.34s =_____psi
f'cr = f'c + 2.33s - 500 =_____psi

Actual f'c =_____psi (f'cr)
Slump =_____in. Air Content =_____%

METHOD 2 - TRIAL MIXTURE TEST DATA (ACI 318/318R-05, 5.3.2.2):

Age (days)	Mix 1 (comp. str.)	Mix 2 (comp. str.)	Mix 3 (comp. str.)
7	_____		_____
28	_____		_____
28	_____		_____
28-day avg.	_____	_____	_____

Mix Design Proportioned to Achieve the Following:

f'cr = f'c + 1200 psi (for f'c 5000 psi or less)
or f'cr = f'c + 1400 psi (for f'c > 5000 psi)

Slump =_____in. Air Content =_____%

REMARKS: _____

_____

_____

Note: Fill in all blank spaces. Use -0- (zero) or N.A. (not applicable).

SUBMITTED BY:
Ready-Mix Supplier: Name _____

Address: _____

Phone Number: _____

SECTION 03 30 30 - CONCRETE TESTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Provide concrete materials sampling and testing.

B. Provide concrete sampling and testing.

1.2 RELATED SECTIONS

A. Section 01 43 00 – Quality Assurance Program

B. Section 01 45 29 –Testing Laboratory Services

1.3 REFERENCES

A. ASTM C31 -Method of Making and Curing Concrete Test Specimens in the Field.

B. ASTM C39 -Method of Test for Compressive Strength of Cylindrical Concrete Specimens.

C. ASTM C42 -Methods of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

D. ASTM C138 -Method of Test for Unit Weight, Yield and Air Content (Gravimetric) of Concrete.

E. ASTM C143 -Method of Tests for Slump of Portland Cement Concrete.

F. ASTM C172 -Method of Sampling Fresh Concrete.

G. ASTM C173 -Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method.

H. ASTM C231 -Method of Test for Air content of Freshly Mixed Concrete by the Pressure Method.

I. ASTM C567 -Method of Test for Unit Weight of Structural Lightweight Concrete.

J. ASTM C900 -Pullout Strength of Hardened Concrete

K. Determine temperature of concrete sample for each strength test.
   1. ASTM E329-09 – Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.

1.4 QUALITY

A. The testing agency retained and paid by the Contractor shall meet requirements of the American Society for Testing and Materials "Specification for Minimum Requirements for Agencies Engaged

in Testing and/or Inspection of Materials used in Construction," ASTM E329. The testing agency shall be responsible for all the concrete mix design and trial batch mixing.

1.5 TESTING

A. All concrete testing shall be performed by an independent testing laboratory hired by the Contractor and approved by the Engineer. All test results shall be submitted to the Engineer for review. All costs associated with testing shall be paid for by the Contractor.

B. Concrete mix designs shall meet New York State Department of Transportation (NYSDOT) Standards and be submitted and approved by the Engineer prior to placement of the concrete. A pour sequence shall be submitted to the Engineer for approval prior to placement of the concrete.

C. Testing shall include the following work as related to concrete testing.
   1. Submission of the proposed materials with supporting information and the establishment of mix designs.
   2. Additional testing of materials or concrete occasioned by their failure by test or inspection to meet specification requirements.
   3. Additional testing and inspection required because of changes in materials or proportions.
   4. Additional testing of materials or practices which do not complying with the Specifications, which could possible result in defective work, thereby rendering it necessary or advisable to perform tests to determine whether or not work is acceptable.
   5. Inactive time spent by inspectors because of cancellations or delays in concrete placement or other work.
   6. Site cured cylinders requested by the Contractor to verify strengths for removal of forms.

1.6 DUTIES AND AUTHORITIES OF DESIGNATED TESTING COMPANY

A. Representatives of the Contractor shall inspect, sample and test the materials and the production of concrete as required by the Engineer.
   1. When it appears that any material furnished or work performed by the Contractor fails to fulfill specification requirements, the testing company shall report such deficiency to the Engineer and the Contractor.

B. The Contractor shall report all test and inspection results to the Engineer and Contractor immediately after they are performed. All test reports shall include the exact location of the work at which the batch represented by a test deposited. Reports of strength tests shall include detailed information on storage and curing of specimens prior to testing.

C. The testing company and its representatives are not authorized to revoke, alter, relax, enlarge or release any requirement of the Contract Documents, nor to approve or accept any portion of the work.

1.7 RESPONSIBILITIES AND DUTIES OF CONTRACTOR

A. The use of testing services shall in no way relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.

B. The Contractor shall submit to the Engineer the concrete materials and the concrete mix designs proposed for use with a written request for approval. This submittal shall include the results of all testing performed to qualify the materials and to establish the mix designs. No concrete shall be placed in the work until the Contractor has received such approval in writing.

C. To facilitate testing and inspection, Contractor shall:
   1. Furnish any necessary labor to assist the designated testing company in obtaining and handling samples at the project or other sources of materials.
   2. Advise the designated testing company not less than 24 hours (excluding weekends and holidays) in advance of operations to allow for completion of quality tests and for the assignment of personnel.
   3. Provide and maintain for the sole use of the testing company adequate facilities for the safe storage and proper curing of concrete test specimens on the project site for the first 24 hours as required by ASTM C31.
   4. Submit copies of mill test reports for shipments of cement, reinforcing steel and prestressing tendons to the Engineer when required.

1.8 ACCEPTANCE OF CONCRETE

A. For evaluation of potential strength and uniformity, each specified mix design shall be represented by at least five tests.

B. The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three consecutive strength tests results equal or exceed the specified strength f'c, and no individual strength test result falls below the specified strength by more than 500 psi.

C. Concrete failing to meet specification shall be replaced at Contractor's expense.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 03 35 00 - CONCRETE COATINGS

PART 1 - GENERAL

1.1 SUMMARY - This section provides for two (2) types of coatings. All concrete surfaces shall be treated with one of these types of coatings as specified below:

A. SEALER - Provide concrete penetrating sealer system on all supported horizontal concrete deck surfaces, concrete gutters and concrete slabs on grade.

B. ANTI-GRAFFITI COATING - Provide an anti-graffiti coating system on all new vertical surfaces, concrete bollards and all surfaces exposed to vandalism as directed by the Engineer.

1.2 RELATED SECTIONS:

A. Section 03 30 00 Cast-in-Place Concrete

B. Section 09 96 23 Graffiti-Resistant Coatings

1.3 QUALITY CONTROL

A. Codes and Standards:
   1. Comply with the provision of the following specification and standards, except as otherwise specified.
      a. NCHRP 244 procedure - Series I, II, III & IV.
      b. Repellency Rating - 80% or better, based on comparison of untreated versus treated samples, where repellency rating of untreated samples =0%. Calculations will be in accordance with NCHRP 244 procedures.
      c. Penetration (1 application) 1/8" - 1/4".
      d. Scaling Resistance of Concrete (ASTM C-672) - Excellent.
      e. Alberta Transportation and Utilities Penetrating Sealer type 1B - Initial Water Repellency (minimum 82.5%; Water Repellency after Abrasion (minimum) 82.5%.
      f. Reduction in chloride infusion by a minimum of 83%
   2. Comply with Local and State VOC (Volatile Organic Compound) regulations where applicable.

B. Sealer Coordination:
   1. Review other sections of these specifications in which curing compounds or paints, are to be provided on concrete surfaces to be sealed to ensure compatibility with the concrete sealer and Anti-graffiti coating.

C. Warranty:
   1. The system manufacturer shall furnish the Owner a written single-source performance warranty that the Concrete Penetrating Sealer System will be free of defects related to workmanship or material deficiency for a five (5) year period from the date of substantial

completion of the project. The following problems shall be specifically covered under the warranty:

a. The concrete surfaces, which receive the concrete sealer, shall not scale, dust or spall.
b. The concrete sealer shall not permit water, salts, deicers, acids and oils to penetrate the treated surfaces.

2. Any repair required under the warranty will be made by the system manufacturer as follows:
   a. Scaling or dusting will be repaired by removing loose surface materials to sound substrate and reapplying the sealer system.
   b. Spalled surfaces (surface deterioration related to the expansive forces of corrosion of reinforcement steel) shall be repaired by epoxy concrete patching done in accordance with current applicable ACI standards.
3. Any required repairs under the warranty shall be made by the system manufacturer. The system manufacturer shall provide the required written warranty.

1.4 SUBMITTALS

A. Submit manufacturer's product, application specifications, testing data and warrantee for approval prior to sealing concrete decks and applying anti-graffiti coating for specified manufacturers

B. In order for the Engineer to determine if a product is equal, submit the following:
1. List of previous work minimum of fifteen (15) projects with eight (8) of them being over ten (10) years
2. Submit photographs for work as it was installed and photographs of the same project after ten (10) years have elapsed.
3. Submit or develop 10-year weather testing results, including but not limited to; coloring weathering, surface wear spalling and salt intrusion results as required by the engineer.
4. Reimburse the owner and owner’s consultant for expenses incurred on 5 inspection field trips to sites containing similar submitted products and work.
5. Perform at the Contractor’s expense all required testing and engineering work as required by the Engineer.

1.5 JOB CONDITIONS

A. Environmental Requirements:
1. Do not proceed with application of materials if ambient temperature is below 40 degrees F. or if ice or frost are covering the substrate.
2. Do not proceed with application if ambient temperature of surface temperature exceeds 100 degrees F.
3. Do not proceed with application of materials in rainy conditions or if heavy rain is anticipated within 8 hours after application. Materials shall not be applied to damp substrates. The surface should be sufficiently dry to observe the spray pattern during application.

PART 2 - PRODUCTS

2.1 SEALER MATERIAL AND ANTI-GRAFFITI COATING

A. Provide a clear liquid lithium silicate type sealing compound, minimum solid content 14%, active solids 100%, which will penetrate the concrete to provide a surface which is resistant to salts, de-ice chemicals, moisture, gasoline, oil and acids. Sealer material shall not alter the appearance of surface texture of concrete surfaces.

B. Sealant material shall be one of the products offered by the manufacturer's listed below.
   1. Sealsource International, SS Harden X SI
   2. Prosoco, Consolideck LS
   3. Ghostshield, Lithi-Tek 4500
   4. Engineer’s Approved Equal

C. Anti-graffiti shall be one of the products offered in Section 09 96 23. Substitute materials or manufacturers will be allowed, upon meeting the requirements of Section 1.03 A and 1.03 B.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine surfaces to receive sealer to assure that conditions are acceptable for application of materials. Concrete shall be cured a minimum of 28 days.

B. Remove dirt, dust and materials that will interfere with the proper and effective application of the water-repellent coating.

C. All caulking, patching and joint sealants should be installed prior to application of this product.

3.2 TRIAL APPLICATION AND TESTING

A. Test Procedure:
   1. Prior to full-scale surface preparation and application of selected material, a trial application shall be conducted. The area shall be 11 feet by 11 feet (121 square feet) in size, at a location determined by the Engineer. The preferred location will be on a sloping ramp.
   2. The trial area shall be cleaned according to manufacturer’s recommendations in the same manner as planned for the entire project. This may include sweeping and cleaning with compressed air, water cleaning under pressure or shot blasting. For the purposes of this test only, sandblasting is an acceptable substitute for shot-blasting.
   3. Upon completion of surface preparation, a core will be removed and tested for water absorption. This is the Untreated Water Absorption value. The test area will then be treated with one gallon of the selected material. From the treated area, two core samples shall be removed. One is to be split with a chisel and dye tested for depth of sealer penetration. The second core is to be tested for Treated Water Absorption. The repellency rating is calculated on the basis of untreated and treated water absorption values.

4. Once field test results are obtained, which meets requirements of Section 1.02.A.1.b. and 1.02.A.1.c, the Contractor will be authorized to perform full-scale surface preparation and application of the selected material. Do not proceed with application unless directed in writing by the Engineer.

3.3 APPLICATION

A. Product shall be applied as packaged at a rate of 125 sq. ft. per gallon. Do not dilute or alter the material.

B. Preferred method of application for anti-graffiti is with low-pressure (15 PSI) airless spray equipment or with a heavily saturated brush or roller. Spray equipment should be equipped with solvent resistant gaskets and hoses.

C. Preferred method of application for concrete sealers is by either brush or roller. Care will be taken to insure that sufficient material is being applied to thoroughly saturate the treatment surfaces maintaining the appropriate square foot coverage rate required.
   1. Product shall be applied to horizontal surfaces in a single saturating application.
   2. Sufficient material shall be applied so that treated surfaces remain wet for a few minutes before penetration into the concrete.
   3. Surface residues, pools and puddles shall be broomed out thoroughly until they completely penetrate into the surface.
   4. Treated surfaces shall be protected from rain and other surface water for a period of not less than eight (8) hours after application.
   5. Treated surfaces shall be protected from excessive foot and vehicular traffic for a period of not less than eight (8) hours after application.

3.4 WATER TEST

A. After the water repellent has dried, provide water and flood the treated surfaces with water as directed by the Engineer. Apply additional coating to areas, which show evidence of water absorption.

3.5 CLEAN-UP

A. When the work of this Section is complete, and at such other times as directed, remove surplus and waste materials, debris, rubbish, equipment, and implements from the site, and leave the work in a clean, neat and acceptable condition, as approved by the Engineer.

END OF SECTION

SECTION 03 41 00 - PRECAST STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Requirements for designing, furnishing, and installing precast prestressed components as indicated on the Contract Drawings and in the Specifications.
2. Precast, prestressed structural concrete components as shown on the Drawings, specified herein, and needed for complete and proper installation including:
3. Design not shown on the Contract Drawings,
4. Erection drawings and Production drawings,
5. Factory inspection and testing per PCI certification requirements,
6. Fabrication of specified precast concrete components,
7. Handling, storage and protection of precast concrete components,
8. Transportation of precast concrete components to erection site,
9. Erection of precast concrete components including all bearing pads, base plates, inserts, clamps, nuts, bolts, and other necessary appurtenances, and other hardware items for connections between cast-in-place concrete and precast components and tolerances for the placement of these components.
10. Work includes but is not limited to:
    a. Independent inspection and testing work.
    b. Cast-in-place concrete
    c. Reinforcement and embedded items in cast-in-place concrete.

1.2 RELATED SECTIONS

A. Section 03 20 00 Concrete Reinforcing

B. Section 03 30 00 Cast-In-Place Concrete

1.3 REFERENCES

A. American Concrete Institute (ACI):
1. ACI 318/318R; Building Code Requirements for Structural Concrete and Commentary.
2. ACI 347 – Recommended Practice for Concrete Formwork.

B. Precast/Prestressed Concrete Institute (PCI)
1. PCI MNL-116, Manual for Quality Control for Plants and Production of Structural Precast Concrete Products.
2. PCI MNL-120, Design Handbook - Precast and Prestressed Concrete.

C. American Society For Testing and Materials (ASTM):
1. ASTM A 36/A 36M; Standard Specification for Carbon Structural Steel.
2. ASTM A 615/A 615M, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

3. ASTM A 767 / A 767M, Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
4. ASTM A 641/ A 461M, Standard Specification for Zinc – Coated (Galvanized) Carbon Steel Wire.
5. ASTM A 153/A 153M; Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A 416/A 416M; Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.
7. ASTM C 31/C 31M; Standard Practice for Making and Curing Concrete Test Specimens in the Field.
8. ASTM C 33; Standard Specification for Concrete Aggregates.
9. ASTM C 39/C 39M; Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
10. ASTM C 42/C 42M; Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
11. ASTM C 150; Standard Specification for Portland Cement.
12. ASTM C 260; Standard Specification for Air-Entraining Admixtures for Concrete.
13. ASTM C 330; Standard Specification for Lightweight Aggregates for Structural Concrete.
14. ASTM C 494/C 494M; Standard Specification for Chemical Admixtures for Concrete.
15. ASTM A706 / A706M, Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

D. American Welding Society (AWS):
1. AWS D1.1/D1.1M; Structural Welding Code - Steel.
2. AWS D1.4/D1.4M; Structural Welding Code - Reinforcing Steel.

1.4 SUBMITTALS

A. Submit the following information to the Engineer for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
1. Product Data: For each type of product indicated, include technical data and tested physical and performance properties.
   a. Portland cement.
   b. Aggregates.
   c. Air-Entraining Admixture.
   d. Water-Reducing, Retarding, Accelerating, and High-Range Water-Reducing Admixtures.
   e. Corrosion Inhibitor Admixture.
   f. Steel Prestressing Tendons.
   g. Mild Steel Reinforcing.
   h. Wire.
   i. Grout.
   j. Sealant.
   k. Bearing Material.
   l. Structural Steel Plates and
   m. Hot-Dip Galvanizing.
   n. Design Mixes: For each concrete mix.
2. Shop Drawings:
   a. Erection Drawings:

1) Member piece marks and completely dimensioned size and shape of each member.
2) Plans and/or elevations locating and defining all products furnished.
3) Sections and details showing connections, cast-in items and their relation to the supporting structures.
    a) Details, dimensional tolerances and related information of other trades affecting precast concrete work should be furnished to precast concrete manufacturer.
        (1) Openings and Joints, between members and between members and structure.
        (2) Description of all loose, cast-in and field hardware.
        (3) Field installed anchor location drawings.
        (4) Erection sequences, when required to satisfy stability, and handling requirements.
    b) If the sequence of erection is critical to the structural stability of the structure, or for access to connections at certain locations, it should be noted on the Contract plans and specifications.

b. Production drawings:
1) Loadings for design:
    a) Initial handling and erection stress limits.
    b) All dead and live loads as specified on the Contract Drawings.
    c) All other loads specified for all members, where applicable.
2) As directed on the Contract Drawings, design calculations of products shall be performed, sealed and submitted for approval by an engineer registered in the state where the project is located, who is experienced in precast, prestressed concrete design.
3) Design steel plank support heads when such headers are determined necessary by the manufacturer's engineer.
4) Refer to architectural drawings for fire ratings where applicable.
5) Design calculations shall be performed by an engineer, registered in the state that the project is located in, and experienced in precast prestressed concrete design. Design calculations to be submitted for approval upon request.
6) Design shall be in accordance with applicable codes or ACI 318 or the latest edition of the PCI Design Handbook.

c. Engineering Data:
1) Submit complete design calculations for all precast members and connections. Indicate all design loads, including live loads, wind loads, seismic loads, and dead loads. Design calculations shall be performed, sealed and submitted by Precast Concrete Contractor's Professional Engineer, licensed to practice in the State where Project is located, who is experienced in precast, prestressed concrete design. Design calculations shall be based on requirements of Performance Requirements and product design criteria specified herein.

d. Samples:
1) Submit three samples, 12"x12", as required.
2) Prior to product fabrication of precast concrete panel units, for projects where more than one finish is required, or where more than one type of reveal is required, prepare a (4'X 4') , partial panel mock up for final approval1 of the color and finish; arrange for architect's timely review of mock up at precaster's plant.
    a) Notify architect when sample is ready for review at precaster's plant, and advise of schedule impact if review is not made in a timely way.

b) Do not start production fabrication of precast concrete architectural panel units until sample units have received architect's written approval.
c) The approved mock-up panels shall be a standard of quality for the color and range of required finish.

e. Test Reports:
1) Submit test report on concrete and other material.
f. Certifications:
1) Design compliance certification.
2) Material compliance certification.
3) Manufacturer's Instructions:
4) Precast structural concrete unit manufacturer's instructions for handling, transporting, and erecting their units.
5) Current welder certificates for welding of reinforcement, shop and field connections.
g. Qualifications Statements:
1) Manufacturer experience.
2) Manufacturer plant PCI certification.
3) Field erection supervisor's resume.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Fabricator Qualifications:
a. Experience: Submit documentation that the precast structural concrete manufacturer has been regularly engaged in manufacturing structural precast prestressed concrete for at least five years.
b. Plant Certification Requirements: Submit documentation that the manufacturer's plant is certified under the Precast/Prestressed Concrete Institute's Plant Certificate Program. Manufacturer shall be certified in category C3A at a minimum.
2. Erector Qualifications:
a. Erector Crew Qualifications:
1) Either provide an erection crew completely familiar with the erection practices of the manufacturer of the precast structural concrete units, or use the manufacturer's erection crew.
2) Regularly engaged for at least 5 years in the erection of precast concrete architectural and structural panels similar to the requirements of this project. (PCI certified erector, certified S2).
b. Field Erector Supervisor's Qualifications:
1) Regardless of the choice of erector crew, employ a representative of the manufacturer of the precast structural concrete units as a field erection supervisor to provide full-time supervision of the erection of the precast structural concrete units.
2) Only employ a field erection supervisor who can demonstrate a minimum of five years continuous experience erecting precast structural concrete units.
3) Submit the field erection supervisor's resume.
3. Design Standards: Comply with ACI 318 and the design recommendations in PCI MNL 120, "PCI Design Handbook—Precast and Prestressed Concrete."
4. Welder Qualifications:

a. Only employ welders for erecting the precast structural concrete units who can demonstrate they are qualified to perform the types of work required by having passed the qualification tests prescribed in AWS D1.1/D1.1M for the procedures.
   1) Submit certified copies of qualification test records that indicate each welder employed to perform the Work has satisfactorily passed the AWS qualification tests for the required welding procedures.

B. Certifications:
   1. Design Compliance Certification:
      a. Submit evidence from the manufacturer certifying that the precast structural concrete units have been designed to meet the load requirements specified.
         1) Submit design calculations stamped by a registered Professional Engineer with structural experience in the type of work being sealed and licensed in the State of New York for all members and connections.
         2) Include evidence that the critical panels unique to the project have been investigated.
   2. Material Compliance Certification:
      a. Submit evidence from the manufacturer certifying that the material complies with the requirements of the Specifications, and submit evidence to support the certification.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Follow the manufacturer's instructions for handling and transporting the products specified in this Section.
   2. Transportation, site handling and erection shall be performed by the precaster, or its agents, with equipment methods, and qualified personnel acceptable to the precaster.
   3. Comply with the requirements of PCI MNL-116 and PCI MNL-120.
   4. Submit the precast structural concrete unit manufacturer's instructions for handling, transporting, and erecting their units.

B. Storage and Protection:
   1. Do not place precast structural concrete units in positions which will cause overstress, warp, or twist in the members.
   2. Place stored precast structural concrete units so that identification marks are discernible.
   3. Stack precast structural concrete units so that lifting devices are accessible and undamaged.
   4. Separate stacked precast structural concrete units by battens across the full width of each bearing point.
   5. Protect all holes and reglets against water and ice in freezing weather.
   6. Do not use upper member of stacked tier as storage area for shorter member or heavy equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with the requirements specified in this Section, manufacturers offering products that may be incorporated in the Work include the following:

1. Precast Prestressed Straight-Strand Structural Members with or without hydronic piping.
2. Precast Prestressed Straight-Strand Voided Members for the repair of the Scarsdale outbound platform.
3. Precast concrete structural insulating wall panels.
4. Precast concrete structural solid wall panels.
5. Precast concrete steel reinforced structural columns, beams and girders.
6. Precast Prestressed solid flat slabs.
7. Architectural Precast Products.
8. Or as noted on Contract Drawings.

2.2 MATERIALS

A. Portland Cement:
1. Provide Portland Cement that complies with the requirements of ASTM C 150, for Type I, Type II or Type III.

B. Aggregates:
1. Provide aggregates that comply with the requirements of ASTM C 33 or ASTM C 330.

C. Water:
1. Provide potable water or water free from foreign materials in amounts harmful to concrete and embedded steel.

D. Admixtures:
1. Air-Entraining Admixture: Provide a product conforming to the requirements of ASTM C 260.
2. Water reducing, retarding, accelerating, high range water reducing admixtures: ASTM C494 or C1017.
3. Viscosity-Modifying Admixtures/Metakaolin Admixture: ASTM C618, Class N
4. Calcium chloride or admixtures containing chlorides shall not be used.

E. Water-Reducing, Retarding, Accelerating, and High-Range Water-Reducing Admixtures:
1. Provide water-reducing, retarding, accelerating, and high-range water-reducing admixture products conforming to the requirements of ASTM C 494/C 494M.
2. Do not provide admixtures containing chlorides.

F. Corrosion Inhibitor Admixture:
1. Provide corrosion inhibitor admixture products conforming to the requirements of ASTM C 494/C 494M, Type C; calcium nitrite.

G. Steel Prestressing Tendons:
1. Provide uncoated, 7-wire, low-relaxation strand conforming to the requirements of ASTM A 416/A 416M, Grade 250 or 270 (Grade 1720 or 1860), or indented, 7-wire, low-relaxation strand (including supplement) conforming to the requirements of ASTM A 886/A 886M, Grade 270 (Grade 1860).

H. Mild Steel Reinforcing:
1. Provide reinforcing steel conforming to the requirements of ASTM A 615/A 615M, Grade 60.

I. Low-Alloy-Steel Reinforcing Bars:

1. Provide reinforcement that is welded conforming to the requirements of ASTM A 706/A 706M.

J. Plain-Steel Welded Wire Fabric:
1. Provide welded wire fabric for concrete reinforcement conforming to the requirements of ASTM A 185, fabricated from steel wire into flat sheets.

K. Steel Reinforcing Supports:
1. Manufacturer's bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place according to PCI MNL 116.

L. Epoxy Coated Interlaid Carbon Fiber Mesh:
1. As per panel manufacturer.

M. Anchors and Inserts:
1. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
2. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished; AWS D1.1, Type A or B, with arc shields.
3. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.
4. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.
5. Stainless steel: ASTM A666, Type 304.
6. Bolts: ASTM A307, A325 or F1554.
7. Threaded Rods: ASTM A36, A193, A307 or F1554.
8. Deformed bar anchors: ASTM A496 or A706.
9. Finish: For exterior steel items, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M, after fabrication, and ASTM A 153/A 153M, as applicable.
   a. Galvanizing Repair Paint: DOD-P-21035A or SSPC-Paint 20.
10. Shop-Primed Finish: Prepare surfaces of non-galvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPCSP 3 and shop-apply lead- and chromate-free, rust-inhibiting primer, complying with performance requirements in FS TT-P-664 according to SSPC- PA 1.

N. Grout:
1. Provide a grout mixture of not less than one part Portland cement to three parts fine sand with a consistency such that joints can be substantially filled without seepage over adjacent surfaces.
2. Provide grout having a 28-day compressive strength of 3500 psi, minimum.
4. Non-shrink grout: Premixed, packaged ferrous or non-ferrous aggregate shrink resistant grout.

O. Bearing Pads:
1. As per panel fabricator’s requirements.

P. Insulation:
1. Comply with thermal and physical requirements specified and or shown on Contract Drawings.

Q. Sealant:
1. Provide gun-grade caulking as specified in Section 07 92 00, Sealers and Caulking.

R. Bearing Material:

1. For Structural Concrete Planks:
   a. Provide asphalt-saturated roofing felt or non-leaching multimonomer plastic strip.
   b. Thickness: 1/8-inch, maximum
2. For Structural Concrete Beams and Girders:
   a. Provide random-oriented fiber-reinforced pads with dimensions as determined by the precast manufacturer.
   b. Provide pads capable of supporting a compressive stress of 4000 psi with no cracking, splitting, or delaminating in the internal portions of the pad.
   c. Acceptable Manufacturer:
      1) JVI, Masticord pad, www.jvi-inc.com.

S. Structural Steel Plates and Shapes:
1. Provide structural steel plates and shapes conforming to the requirements of ASTM A 36/A 36M.

T. Hot-Dip Galvanizing:
1. Provide hot-dip galvanizing conforming to the requirements of ASTM A 153/A 153M.

2.3 FABRICATION

A. Comply with the manufacturing procedures and tolerances in PCI MNL-116.

B. Formwork: Comply with ACI 347. Prefabricated mold shall be one-piece seamless rigid molds for exposed faces. Prevent deformation of molds and maintain mold surfaces free of irregularities, dents, sags, or damage of any kind.

C. Anchorage Hardware: Fabricate with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations.

D. Furnish loose steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast architectural concrete units to supporting and adjacent construction.

E. Cast-in reglets, slots, holes, and other accessories in precast architectural concrete units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.

F. Reinforcement: Comply with recommendations in CRSI's "Manual of Standard Practice" and PCI MNL 116 for fabricating, placing, and supporting reinforcement.

G. Reinforce precast concrete wall units to resist handling, transportation, and erection stresses.

H. Pre-stress tendons for precast concrete wall units by either post-tensioning or pretensioning method. Comply with PCI MNL 116.

I. Mix concrete according to PCI MNL 116 and requirements in this Section.

J. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 116 for measuring, mixing, transporting, and placing concrete.

1. The production of SCC shall be carried out in plants in which the equipment, operation and materials are suitably controlled.
2. All production staff involved in the production of SCC shall have been trained and possess experience in SCC.

K. Identify pickup points of precast concrete wall units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast concrete wall unit on a surface that will not show in finished structure.

L. Openings:
1. Manufacturer shall provide for openings 12 inch square or larger as shown on the Contract Drawings.
2. Other openings shall be located and field drilled or cut by the trade after erection. Openings shall be approved by both architect and precaster before drilling or cutting.

M. Cure concrete, according to requirements in PCI MNL 116, by accelerated heat curing using low-pressure live steam or radiant heat and moisture.
1. SCC can set faster than conventional concrete. Initial curing shall commence as soon as practicable after placement to minimize the risk of shrinkage cracking.

N. Fabricate precast concrete wall panels straight and true to size and shape, with exposed edges and corners precise and true so each finished panel complies with PCI MNL 116 product tolerances as well as position tolerances for cast-in items.

O. Patching: Shall be acceptable providing the structural adequacy of the product and the appearance are not impaired.

P. Damaged, chipped or discolored units shall be replaced, patched or refinished as directed by the Architect and/or Engineer, and to their approval.

Q. Compressive Strength:
1. Cure the units at the manufacturer's plant by steam curing or other suitable method to secure a 3000 psi, minimum, compressive strength at the time of the initial prestress, and a 5000 psi, minimum, compressive strength after 28 days.

R. Corrosion Inhibitor Admixture:
1. Add corrosion inhibitor admixture at the rate of 3 gallons per cubic yard to the concrete mix.
2. Decrease water in mix to account for addition of admixture.

S. Provide a concrete cover over reinforcing in accordance with ACI 318/318R unless noted otherwise on the Contract Drawings.

T. For the voided planks for use in the repair of Scarsdale Station outbound platform:
1. Top surface of plank shall be rake finished transversely with amplitudes of one quarter inch minimum above and below the plane to assure long term composite action, where a topping is specified.
2. Plank core ends should be filled solid for 16" with non-shrink grout or be cast solid. Similarly, each opening shall have a minimum six inch solid concrete or non-shrink grout all around.
3. Openings 10" x 10" or larger should be cut or fabricated at manufacturing. The perimeter of the opening should have the core filled with non-shrink grout and the corners reinforced or

cast solid and reinforced. No coring of openings shall be allowed without the permission of the manufacturer, and acceptable to the engineer.

4. Plank voids should be filled with Foam Insulation to prevent water infiltration or condensation. In the alternative, each core should be drilled with two 3/8 holes, one at the beginning, one at the end, to drain water. When planks are used over water or in a humid environment, voids should be filled with EPS Foam Insulation.
5. Planks should be chamfered when placed on edge of platform, and have a drip edge formed into the planks.
6. Planks shall have galvanized "Unistrut" embedded within casting as shown in the plans, and shall be integral with precast plank pour.
7. Identification. Each plank shall be listed in the schedule shown on the manufacturer's erection plan and placed legibly on each plank at time of manufacture. Each plank shall be provided with anchorage as detailed, per 1.04.A above.

2.4 FINISHES

A. Finish the precast structural concrete in conformance to the requirements of PCI MNL-116.

B. For surfaces to be painted, provide the finish required by paint manufacturer.

C. Finish exposed–face surfaces of precast concrete wall panels to match approved design reference sample. Refer to architectural drawings for finishes.

2.5 SOURCE QUALITY CONTROL

A. Quality Control Testing: Test and inspect precast concrete according to PCI MNL 116 requirements.

B. Concrete Compression Tests:
   1. Test Method:
      a. Direct the precast prestressed plank manufacturer to test the concrete compressive strength of the concrete used to fabricate the planks in accordance with the requirements of ASTM C 39/C 39M.
      b. Mold and cure four test specimens for each concrete compression test in accordance with ASTM C 31/C 31M.
      c. Perform at least one concrete compression test for each 75 cubic yards of concrete, but not less than one concrete compression test for each day's production of concrete planks.
   2. Acceptance Criteria:
      a. Test two specimens to verify stress transfer strength, and test two additional specimens after 28 days for acceptance.
      b. The strength level of the concrete is satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual test result is below the specified strength by more than 500 psi.
   3. Test Reports:
      a. Submit reports that document the results of all concrete tests and inspections performed immediately after the work is performed.
      b. In the reports, state whether the tested and inspected items comply with specified requirements or deviate from them.

C. Non-Conforming Test Results:

1. If the strength of the tested cylinders falls below the specified compressive strengths, the Engineer has the authority to order a change in the mix proportions for the remaining concrete being poured.
2. If required by the Engineer, obtain and test core specimens from the hardened concrete planks in accordance with ASTM C 42/C 42M.

D. In accordance with the requirements of Section 01 40 00, Quality Requirements, will be verified by a code-required Approved Agency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Site access: General Contractor shall be responsible for providing suitable access to the building, proper drainage and firm, level bearing for the hauling and erection equipment to operate under their own power.

B. Preparation of structures to receive precast panels: General Contractor shall be responsible for:
1. Providing true, level bearing surfaces on all field placed bearing surfaces.
2. Placement and accurate alignment of anchor bolts, plates or dowels in column footings, grade beams and other field placed supporting members.
3. All pipes, stacks, conduits and other such items shall be stubbed off at a level lower than the bearing plane until after the plank are set. Masonry, concrete or steel shall not be installed above plank-bearing surface until after the plank is in place.

C. Install precast concrete members.
1. Erection shall be carried out by competent erectors that are PCI qualified.
2. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
3. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
4. Openings in planks shall be field cut only after grout has cured, unless authorized by the manufacturer's engineer.
5. Members shall be properly aligned. Variations between adjacent members shall be reasonably leveled out by jacking, bolting or any other feasible method as recommended by the manufacturer.

D. Anchor precast concrete units in position by bolting, welding, grouting, or as otherwise indicated.

E. Welding: Perform welding in compliance with AWS D1.1 and AWS D1.4, with qualified welders.
1. Repair damaged steel surfaces by cleaning and applying a coat of galvanized repair paint to galvanized surfaces or by re-priming damaged painted surfaces.

F. Install precast concrete wall units level, plumb, square, true, and in alignment without exceeding the non-cumulative erection tolerances of PCI MNL 125 or 127.

G. Repair exposed exterior surfaces of precast concrete wall units to reasonably match color, texture, and uniformity of approved mock up panel(s) and surrounding precast concrete when repair is permitted by Architect and/or Engineer.

H. Subject to approval of the Architect and precast Engineer, precast concrete wall panels may be drilled or "shot" by other trades for attachment of other building components provided no contact is made with prestressing steel. Should spalling occur, repair of the spall shall be the responsibility of the trade doing the drilling or the shooting.

I. Clean exposed surfaces of precast concrete units after erection to remove weld marks, other markings, dirt, and stains caused by the erector. If other trades cause damage, marks, dirt, or stains they shall be liable for the costs of cleaning or repair.

J. Inspection and Acceptance: Final inspection and acceptance of erected precast concrete units shall be made by the Architect and/or Engineer within a reasonable time after the precast units are installed and final alignment of the units is completed.

END OF SECTION

SECTION 03 53 00 – POLYMER MODIFIED CONCRETE TOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Summary of Work: Provide Cementitious Leveling Bed, as shown and specified per Contract Documents; including, but not limited to: Floor leveling coat on station platform and stairs.

1.2 SUBMITTALS

A. General: Refer to Section 01 33 00 of this Document.

B. Samples: If specifically requested.

C. Product Data: Submit manufacturer's specifications, data, and installation instructions for review.

D. Closeout: Guarantee; Provide in required form for a period of one (1) year from date of final acceptance by Metro-North.

1.3 QUALITY REQUIREMENTS

A. General: Refer to Division 1, Section 01 43 00 – Quality Assurance

B. Qualifications: Installer specializing in the work of this Section with minimum three (3) years documented experience; manufacturer approved.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. GENERAL: The products herein specified are completely pre-engineered products of the listed manufacturer and establish a criterion for the approval of substitutions. Products must be part of a pre-engineered system, equivalent in function, quality, composition and method of application and has performed satisfactorily for patching or overlaying for a minimum of five years to be considered for approval as an "Approved Substitute".

B. Polymer-modified portland cement mortar Sika Top 111 Plus, and Sika Armatec 110 EpoCem substrate primer as manufactured by Sika Corporation, Lyndhurst, New Jersey or approved equal.

1. Component A shall be a liquid polymer emulsion of an acrylic copolymer base and additives.

a. pH: 4.5-6.5

b. Film Forming Temperature: 73°F max.

c. Tear Strength: 950-psi min.

d. Elongation at Break: 500% min.

e. Particle Size: less than 0.1 micron

2. Component A shall contain an organic, penetrating corrosion inhibitor which has been independently proven to reduce corrosion in concrete via ASTM G3 (half-cell potential tests). The corrosion inhibitor shall not be calcium nitrite and shall have a minimum of 5 years of independent field testing to document performance on actual construction projects.

3. Component B shall be a blend of selected portland cements, specially graded aggregates, admixtures for controlling setting time, water reducers for workability, and an organic accelerator.

4. The materials shall be non-combustible, both before and after cure.

5. The materials shall be supplied in a factory-proportioned unit.

6. The polymer-modified, portland cement mortar must be placeable from 1/2-in. to 1-in. in depth per lift for horizontal applications.

C. To prepare a polymer-modified portland cement concrete: aggregate shall conform to ASTM C-33. The factory proportioned unit shall be extended with 42-lb. max. of a 3/8 in. (No.8 distribution per ASTM C-33, Table II) clean, well-graded, saturated surface dry aggregate, having low absorption and high-density aggregate must be approved for use by the Engineer.

D. Aggregate Thickness Extender

1. To prepare the polymer-modified portland cement concrete, the factory proportioned unit maybe extended with 35 lbs. Max. of a minus ½ in. or 3/8 in. clean, well-graded, saturated surface dry aggregate, having low absorption and high density. Aggregate shall conform to ASTM C-33. Aggregate must be approved for use by the Engineer.

E. Joint Seals and Sealant: Refer to Section 07 91 00 – Preformed Joint Seals and Section 03 35 00 – Concrete Coatings.

PART 3 EXECUTION

3.01 PERFORMANCE

A. Product Handling:

1. Delivery: Schedule delivery of materials at the site at such time as required for proper coordination of the work. Receive materials in manufacturer’s unopened packages and bearing manufacturer’s label.

2. Storage: Store materials in a dry and well-ventilated place, adequately protected from damage and exposure to the elements.

3.02 PREPARATION

A. Examination: Examine conditions of work in place before beginning work; report defects to engineer prior to commencement of work.

B. Measurements: Take field measurements; report variance between plan and field dimensions.

3.03 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

B. Surface Preparation: Remove all deteriorated concrete, dirt, oil, grease and all bond materials from surface. Be sure repair area is not less than ¼ inch in depth. Preparation work should be done by high pressure water blast, scabbler, or other appropriate mechanical means to obtain an aggregate-fracture surface with a minimum surface profile of +/- 1/8 inch. Saturate surface with clean water. Substrate should be saturated surface dry (SSD) with no standing water during application.

C. Mixing and Application:

1. Mechanically mix in appropriate sized mortar mixer or with a Sika jiffy paddle and low speed (400-600 rpm) drill. Pour approximately 4/5 gal Component A into the mixing container. Add Component B while continuing to mix. Mix to a uniform consistency for a maximum of three minutes. Add remaining Component A to mix if a looser consistency is desired. Should smaller quantities be needed, be sure the components are measured in the correct ratio and that the Component B is uniformly blended before mixing the components together. Mix only that amount of material that can be placed in 30 minutes. Do not retemper material.

2. Mixing of the polymer-modified portland cement concrete: Pour all of Component A into the mixing container. Add Component B while continuing to mix. Add correct amount of the pre-approved coarse aggregate, and continue mixing to a uniform consistency. Mixing time should be 3 minutes maximum.

3. Placement Procedure: At the time of application, the substrate should be saturated surface dry with no standing water. Mortar and/or concrete must be scrubbed into substrate filling all pores and voids. While the scrub coat is still wet, force material against edge of repair, working toward center. If repair area is too large to fill while scrub coat is still wet use Sika Armatec 110 EpoCem in lieu of scrub coat (See Spec Component SC-200). After filling, consolidate, then screed. Allow mortar or concrete to set to desired stiffness, then finish with trowel, manual or power, for smooth surface. Broom or burlap drag for rough surface. Areas where the depth of the repair is less than 1-inch shall be repaired with polymer-modified portland cement mortar. In areas where the depth of the repair is greater than 1 inch, the repair shall be made with polymer-modified portland cement concrete.

4. As per ACI recommendations for portland cement concrete, curing is required. Moist cure with wet burlap and polyethylene, a fine mist of water or a water-based* compatible curing compound. Moist curing should commence immediately after finishing and continue for 48 hours. Protect newly applied material from rain, sun, and wind until compressive strength is 70% of the 28-day compressive strength. To prevent from freezing cover with insulating material. Setting time is dependent on temperature and humidity. *Pretesting of curing compound is recommended.

5. Adhere to all procedures, limitations and cautions for the polymer-modified portland cement mortar in the manufacturers current printed technical data sheet and literature.

3.04 CLEANING

A. General: Upon completion, thoroughly clean exposed surfaces per manufacturer's instructions.

END OF SECTION

SECTION 03 60 00 - GROUTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements for the grouts, except for masonry grouts, indicated on the Contract Drawings and required in other Specification Sections.

1.2 REFERENCED SECTIONS

A. Division 1 – General Requirements - Submittal Procedures.

B. Section 03 30 00 - Cast-In-Place Concrete.

1.3 CITED STANDARDS

A. American Concrete Institute (ACI):
   1. ACI 305R, Hot Weather Concreting.
   2. ACI 306R, Cold Weather Concreting.
   3. ACI 306.1, Standard Specification for Cold Weather Concreting.
   4. ACI 308, Standard Specification for Curing Concrete.
   5. ACI 351.1R, Grouting between Foundations and Bases for Support of Equipment and Machinery.

B. American Society for Testing and Materials (ASTM):
   1. ASTM C 33, Standard Specification for Concrete Aggregate.
   2. ASTM C 109/C 109M, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using two-inch or 50-mm Cube Specimens).
   3. ASTM C 150, Standard Specification for Portland Cement.
   4. ASTM C 191, Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
   5. ASTM C 827, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
   6. ASTM C 1090, Standard Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout.
   7. ASTM C 1107, Standard Specification for Packaged Dry, Hydraulic Cement Grout (Non-shrink).

1.4 QUALITY CONTROL

A. Certifications:
   1. Submit independent laboratory test reports from the grout manufacturer certifying that the non-shrink grout meets the performance requirements specified in Paragraph 1.03.A.

1.5 SUBMITTALS

A. Submit the following information to the Engineer for approval in accordance with the requirements of Division 1 – General Requirements, Submittal Procedures:
   1. Product Data:
      a. Non-shrink non-metallic grout
   2. Quality Assurance/Control Submittals:
      a. Design Data:
         1) Sand/cement grout design mixes.
      b. Test Reports:
         1) Sand/cement grout design test reports
      c. Certificates:
         1) Grout manufacturer non-shrink certification
      d. Manufacturers' Instructions:
         1) Manufacturer's placing instructions

1.6 GENERAL DESIGN AND FABRICATION REQUIREMENTS:

A. Non-Shrink Grout:
   1. Provide non-shrink grout that meets the following requirements from the time of placement:
      a. Early Height Change: 0.0 to 4.0 percent when tested in accordance with the requirements of ASTM C 827.
      b. Hardened Height Change: 0.0 to 0.3 percent when tested in accordance with the requirements of ASTM C 1090.
      c. Compressive Strength: 4,000 psi developed with a trowelable mix within 24 hours when tested in accordance with the requirements of
      d. ASTM C 109/C 109M.
      e. Indicating placement time: Not less than 60 minutes based on initial set, when tested in accordance with the requirements of ASTM C 191.
   2. Provide grout that meets the performance requirements of ASTM C 1107 for Grades A, B, and C.

1.7 DELIVERY, STORAGE AND HANDLING:

A. During delivery and handling, provide a protective covering over grout materials to prevent moisture damage and contamination.

B. Store grout materials in undamaged condition with seals and labels intact as packaged by the manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aggregate:
   1. Fine Aggregate: Provide fine aggregate conforming to the material quality requirements of ASTM C 33.

2. Reduced Size Coarse Aggregate: Provide aggregate conforming to the size requirements for AASHTO Number 8 aggregate as specified in AASHTO M 6.

B. Non-Shrink Metallic Grout:
1. Provide a factory-premixed material containing no corrosive irons, aluminums, chemicals, or gypsums.
a. Provide a ready-mix type of grout requiring only the addition of water.
1) Provide water proportions conforming to the manufacturer's specifications for the desired mix consistency.
b. Do not add other materials to the grout.
c. For grout applications not in contact with sewage, provide grout manufactured using Type I (Normal) cement as specified in Section 03 30 00, Cast-In-Place Concrete.
d. For grout applications in contact with sewage, provide grout manufactured using Type II (Sulfate Resistant) cement as specified in Section 03 30 00, Cast-In-Place Concrete.
e. To enhance impact resistance, provide grout containing metallic aggregate.
2. Acceptable Manufacturers:
a. Five Star Products, Inc., http://fivestarproducts.com.
b. US Grout, LLC, www.usgrout.com.
c. Approved equal.

C. Non-Shrink Non-Metallic Grout:
1. Provide a factory-premixed material containing no corrosive irons, aluminums, chemicals, or gypsums.
a. Provide a ready-mix type of grout requiring only the addition of water.
1) Provide water proportions conforming to the manufacturer's specifications for the desired mix consistency.
b. Do not add other materials to the grout.
c. For grout applications not in contact with sewage, provide grout manufactured using Type I (Normal) cement as specified in Section 03 30 00, Cast-In-Place Concrete.
d. For grout applications in contact with sewage, provide grout manufactured using Type II (sulfate resistant) cement as specified in Section 03 30 00, Cast-In-Place Concrete.
2. Acceptable Manufacturers:
a. Five Star Products, Inc., http://fivestarproducts.com.
b. US Grout, LLC, www.usgrout.com.
c. Approved equal.

D. Portland Cement:
1. Provide Portland cement conforming to the requirements of ASTM C 150, Type I or Type II.
a. For applications where the grout will be in contact with sewage, use only Type II (sulfate resistant) cement.

E. Water:
1. Provide potable quality water that is free from deleterious amounts of acids, alkalis, and organic substances.

2.2 MIXES

A. Neat Cement:

1. Use Type I Portland cement (Normal) and water in the same proportions specified in Section 03 30 00, Cast-In-Place Concrete, for Class A cast-in-place concrete, but omit the fine and coarse aggregates from the mix.

B. Sand/Cement Grout:
1. Proportion the proposed design mix using a mixture of Portland cement, fine aggregate, and water in the proportion specified for Class A cast-in-place concrete as specified in Section 03 30 00, Cast-In-Place Concrete.
a. For grout swept in by mechanism, add reduced size aggregate.

2.3 SOURCE QUALITY CONTROL

A. Submit the grout manufacturer's descriptive product data and current specifications covering the non-shrink metallic grout and non-shrink non-metallic grout products to the Engineer for approval.

B. Submit sand/cement grout design mixes and test reports for the grout to the Engineer for approval.
1. Follow the criteria listed for cast-in-place concrete in Section 03 30 00, Cast-In-Place Concrete.
a. Prior to production of grout that will be swept in by mechanism, submit a design mix indicating both material proportions and the water-cement ratio.
2. Make adjustments in the proposed design mix as directed by the Engineer at no increase in Contract Price.

PART 3 - EXECUTION

3.1 PREPARATION

A. Submit the grout manufacturer’s placing instructions to the Engineer for approval.

B. Surface Preparation:
1. Clean the surfaces to be grouted to a condition free of oil, grease, laitance, dirt, and other contaminants.
2. Remove loose material.
3. Remove rust, paint, and oil from metal components that will be in contact with grout.
4. Perform additional surface preparation in accordance with the grout manufacturer's instructions.

C. Formwork:
1. Use forming procedures that allow proper and complete placement of the grout.
2. Pre-treat wood forms with forming oils so that the forms do not absorb moisture.
3. Anchor formwork support elements so no movement is possible.

D. Mixing the Grout:
1. Use a power operated mechanical mixer of sufficient capacity to mix complete batches of grout without interruption.
2. Mix non-shrink grout in accordance with manufacturer’s published instructions.
3. Mix sand/cement grout in accordance with the requirements specified for mixing Class A cast-in-place concrete in Section 03 30 00, Cast-In-Place Concrete.

3.2 INSTALLATION

A. Non-Shrink Metallic Grout:
   1. Place non-shrink metallic grout in exposed or unexposed areas where grouting or equipment is subject to heavy vibratory forces.
   2. Place non-shrink metallic grout in accordance with the manufacturer's published instructions.

B. Non-Shrink Non-Metallic Grout:
   1. Place non-shrink non-metallic grout only at locations indicated on the Contract Drawings.
   2. Place non-shrink non-metallic grout in accordance with the manufacturer's published instructions.

C. Equipment and Machinery Support:
   1. To support installed equipment and machinery, place non-shrink grout between the foundations of the supporting structures and the equipment and machinery bases in accordance with the requirements of ACI 351.1R.

D. Grouting Process Areas:
   1. Provide sand/cement grout when grouting process areas.
   2. For applications, other than those wherein grout is placed by a mechanism to sweep the grout into place, place and cure grout as follows:
      a. After the surface has been prepared as specified in Paragraph 3.01B, first saturate the surface to be grouted with water, remove any excess water, and then brush on a coat of Neat Cement.
         1) Place the grout while the Neat Cement is wet.
      b. Place the grout in a single pour, consolidate, and finish the grout with a steel trowel.
         1) In vertical applications, place grout in monolithic pours.
      c. Cure and seal the grout in accordance with ACI 308.
   3. For applications wherein grout is placed by a mechanism to sweep the grout into place, place and cure the grout as follows:
      a. After the surface has been prepared as specified in Paragraph 3.01B, first saturate the surface to be grouted with water, remove any excess water, and then brush on a coat of Neat Cement.
         1) Place the grout while the Neat Cement is wet.
      b. Place the grout in a single pour, starting at the center of the area to be grouted and working the grout out towards the perimeter and walls.
         1) As grout placement proceeds, slowly strike off the grout using screeds attached to the bottom of the equipment's grouting mechanism that are adjusted to produce the proper depth.
         2) Take care not to damage the surface of the grout when filling depressions and removing excess grout in front of screed blades.
      c. Consolidate and finish the grout using a wood float.
      d. Score joints at the perimeter of the grouted area and walls to the full depth of the grout.
         1) Do not saw joints after the grout is cured.
      e. Cure the grout using wet burlap or inundation in accordance with the requirements of ACI 308.
         1) Do not cure the grout using liquid curing compounds.
      f. After curing the grout, fill scored joints with joint sealer.

3.3 FIELD QUALITY CONTROL

A. Process Areas Grouting:
   1. After placing sand/cement grout and completing any screeing operations, use a straight edge to check exposed surfaces for trueness.

3.4 PROTECTION

A. Remove formwork supports only after the grout has hardened.

B. Protect grout against high and low temperatures and unfavorable environmental conditions in accordance with the requirements of ACI 305R, ACI 306R, and ACI 306.1 for placement of concrete until it has cured.

END OF SECTION

SECTION 03 63 00 - EPOXY GROUTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies 2-component, rapid-hardening, moisture-insensitive epoxy resin grout.

B. Use the material for the following:
   1. Repair and seal horizontal, vertical and overhead surface cracks and other minor damaged areas in hardened concrete where indicated on the Contract Drawings, or as directed by the Engineer

1.2 SUBMITTALS

A. Product Data: Submit product data indicating product standards, physical and chemical characteristics, technical specifications, limitations, and general recommendations regarding the material.

B. Quality Control Submittals:

C. Submit manufacturer’s certificate that documents that product meets or exceeds specified requirements.

D. Submit manufacturer’s installation instructions.

1.3 QUALITY ASSURANCE

A. Qualifications: Materials shall be manufactured by a company specializing in manufacturing the product specified in this section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer’s instructions for storage, shelf-life limitations, and handling.

1.5 1.05 RELATED SECTIONS

A. 03 93 00 Concrete Rehabilitation

PART 2 - PRODUCTS

2.1 MATERIALS

A. For Crack Repair: Epoxy Resin Grout shall be low modulus material for horizontal applications and high modulus for vertical and overhead applications. The grout shall be: Two-part, moisture-insensitive, epoxy grout meeting the following minimum characteristics:
   1. Bond Strength: 1,500 psi
   2. Tensile Strength: 5,000 psi
   3. Elongation: 2 percent at 7 days at 70 degrees (F)
   4. Compressive Strength: 8,600 psi
   5. Flexural Strength: 7,400 psi
   6. Rapid-Hardening: Permanent set in 20 minutes.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that surfaces are sound and ready to receive work. Do not proceed until surfaces are made acceptable to the Engineer.

B. Clean surface. It may be dry or damp, but free of standing water. Remove dust, laitance, grease, curing compounds, impregnations, waxes, foreign particles, disintegrated materials, and all other substances that may affect bond strength.

3.2 APPLICATION

A. Mixing:

   1. Pre-mix each component.
   2. Proportion parts by volume of each component as indicated by the manufacturer’s instructions.
   3. Mix only that quality that can be applied within its pot life.

B. Application:
   1. Crack Repairs: Seal cracks by pouring or injecting material into vee-notched crack. Continue application until completely filled. Seal far side of member prior to filling if cracks reflect through.

END OF SECTION

SECTION 03 93 00 - CONCRETE REHABILITATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide labor, materials, tools, equipment, and services necessary for the performance of structural concrete repair where required. Completely repair all concrete defects as specified, including but not limited to the following.
   1. The removal and disposal of unsound structural concrete and its replacement with an approved filler material.
   2. Repair of concrete reinforcing bars.
   3. Non-cosmetic repair of deficient concrete elements and surfaces, including platforms, walls, and floors.
   4. Vertical, horizontal and overhead crack repair via pressure injection of epoxy grout material.

1.2 REFERENCES

A. Unless otherwise noted, the latest edition of the following codes and standards shall govern this work. If any conflicts exist between these codes and standards the more restrictive requirements shall govern.
   1. American Railway Engineering and Maintenance-of-Way Association (AREMA)
   2. American Concrete Institute (ACI)
      a. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
      b. ACI 301 - Specifications for Structural Concrete for Buildings.
      c. ACI 304 - Guide for Measuring, Mixing, Transporting and Placing Concrete.
      d. ACI 305R - Hot Weather Concreting.
      e. ACI 306R - Cold Weather Concreting.
      f. ACI 318 - Building Code Requirements for Reinforced Concrete.
      g. Other ACI recommended practices shall be followed where applicable except as may be specifically deviated elsewhere in this specification.
   3. American Society for Testing and Materials (ASTM)
      a. ASTM C31 - Test Methods of Making and Curing Concrete Test Specimens in the Field.
      b. ASTM C33 - Specification for Concrete Aggregates.
      c. ASTM C39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens.
      d. ASTM C94 - Specification for Ready-mixed Concrete.
      e. ASTM C138 - Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
      f. ASTM C143 - Test Method for Slump of Hydraulic Cement Concrete
      g. ASTM C150 - Specification for Portland Cement.
      h. ASTM C171 - Specification for Sheet Materials for Curing Concrete.
      i. ASTM C192 - Test Method of Making and Curing Concrete Test Specimens in the Laboratory.
      j. ASTM C260 - Specification for Air-Entraining Admixtures for Concrete.

k. ASTM C309 - Specification for Liquid Membrane-forming Compounds for Curing Concrete.
l. ASTM C494 - Specification for Chemical Admixtures for Concrete.
m. ASTM C685 - Specification for Concrete Made by Volumetric Batching and Continuous Mixing.
n. ASTM C920 - Specification for Elastomeric Joint Sealants.
o. Other ASTM specifications shall be followed where applicable except as may be specified elsewhere in this specification.

4. New York State Department of Transportation Standard Specifications, Construction and Materials.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's data indicating product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

B. Shop Drawing: Submit drawings showing locations and details of concrete repair.

C. Quality Assurance:
1. Certificates: Submit manufacture's certification that specified products meet or exceed specified requirements.
2. Specialist's qualification statement: Before beginning any work, submit statement showing compliance with the repair specialist requirements specified below under Quality Assurance. List the names and qualifications of each foreman and craftsman proposed for employment on this project. Include the names of projects executed by the firm, the foremen, and the craftsmen; and the names, addresses, and current telephone numbers of each of the owners or clients.

D. Closeout Submittals:
1. Project record documents: Submit documentation and drawings as necessary to explain the type and location of each concrete repair and structural reinforcement repair.

1.4 QUALITY ASSURANCE

A. Repair Specialist:
1. Firm: Perform work utilizing a firm regularly engaged in repair of structural concrete and which has completed similar projects.
2. Foremen: Employ skilled foremen for directing the work at all times, each of whom has successfully perform and completed repair of structural concrete on similar projects. Working without a knowledgeable and experienced full-time foreman is prohibited.
3. Craftsmen: Employ skilled workers for executing the work; and at all times have these persons under direct supervision of the foreman. Each worker shall have performed and completed the same types of work as required herein.
4. Manufacturer's Representative: Have the manufacturer's specialist for polymer modified concrete topping present for the first two days of application and for three subsequent shorter visits.

B. Change of Firm or Personnel: Only the approved firm, foremen, and craftsmen, may work on the project. Fourteen calendar days before making any change of firm, submit such change, including a statement of qualifications as required above under Quality Assurance Submittals, for approval. Failure to comply with this provision will, at the Engineer's discretion, be sufficient cause to reject the work.

C. Engineering Design: Design reinforcement splices under direct supervision of a professional structural engineer experienced in design of this type and licensed in the State of New York. Design Jacking system under direct supervision of a professional structural engineer experienced in design of this type and licensed in the State of New York. Design of Jacking system shall be based on a Factor of Safety of 2.5.

D. Regulatory Requirements: Comply with AWS D1.4. for welding, and "Controlled Inspections" requirements of the New York State Building Code.

E. Mock-ups:
   1. Perform mock-ups demonstrating the following:
      a. Repair of four spalled concrete repair categories: Horizontal and vertical surfaces, both with shallow (not more than ¾" in depth) and deep (more than ¾" in depth) deteriorations. The area of repair shall be at least 4 square feet. Demonstrate the ability to produce a flush and matching surface.
      b. Welding of exposed corroded reinforcing to new lapped or to new abutting reinforcing. If both types of reinforcing repairs are anticipated, provide mock-ups of each.
      c. Filling of cracks with epoxy grout. Fill a crack not less than 12 inches long, with an average width of 1/8 inch and an average depth of not less than 2 inches.
   2. Because of the nature of the work requiring these mock-ups, and the fact that the procedures are more critical than the aesthetics of the finished product, notify the Engineer at least 48 hours in advance of performing each mock-up so that the Engineer may be present at his discretion.

1.5 RELATED SECTIONS

A. 03 20 00 Concrete Reinforcement

B. 03 63 00 Epoxy Grouting

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site only as they are needed and can be incorporated into the work.

B. Except for reinforcing, deliver products in pre-measured containers only.

C. Store and protect products in a manner that will keep them free from contaminants and that will preclude their exposure to moisture.

D. Comply with manufacturer's instructions for storage, shelf-life limitations, and handling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. GENERAL: The products herein specified are completely pre-engineered products of the listed manufacturer and establish a criterion for the approval of substitutions. Products must be part of a pre-engineered system, equivalent in function, quality, composition and method of application and has performed satisfactorily for patching or overlaying for a minimum of five years to be considered for approval as an "Approved Substitute".

B. Polymer-modified portland cement mortar Sika Top 111 Plus, and Sika Armatec 110 EpoCem substrate primer as manufactured by Sika Corporation, Lyndhurst, New Jersey or approved equal.
   1. Component A shall be a liquid polymer emulsion of an acrylic copolymer base and additives.
      a. pH: 4.5-6.5
      b. Film Forming Temperature: 73°F max.
      c. Tear Strength: 950-psi min.
      d. Elongation at Break: 500% min.
      e. Particle Size: less than 0.1 micron
   2. Component A shall contain an organic, penetrating corrosion inhibitor which has been independently proven to reduce corrosion in concrete via ASTM G3 (half-cell potential tests). The corrosion inhibitor shall not be calcium nitrite, and shall have a minimum of 5 years of independent field testing to document performance on actual construction projects.
   3. Component B shall be a blend of selected portland cements, specially graded aggregates, admixtures for controlling setting time, water reducers for workability, and an organic accelerator.
   4. The materials shall be non-combustible, both before and after cure.
   5. The materials shall be supplied in a factory-proportioned unit.
   6. The polymer-modified, portland cement mortar must be placeable from 1/2-in. to 1-in. in depth per lift for horizontal applications.
   7. For repair depths greater than 1”, prepare a polymer-modified portland cement concrete: aggregate shall conform to ASTM C-33. The factory proportioned unit shall be extended with 42-lb. max. of a 3/32” to 3/8” (size 8 grading), in accordance with ASTM C-33, Table 3). The material shall be clean, well-graded, saturated surface dry coarse aggregate, having low absorption and high density aggregate must be approved for use by the Engineer.

C. Steel Tie Wire: ASTM A82, Size No. WO.5.

D. Bonding Agent: Polymer-resin emulsion, latex emulsion, or polyvinyl acetate emulsion; water-resistant when cured.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare in accordance with the requirements of the materials and methods demonstrated by the accepted mock-ups.

B. Inspection:

1. Together with the repair specialist examine the substrate and the conditions under which the work is to be performed and notify the Engineer in writing of any conditions detrimental to the proper and timely completion of the work.
2. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the specialist and the Engineer.

C. Protection:
1. Provide and maintain effective non-staining protection for adjacent surfaces and areas below the work during performance of the work. Protect surfaces from damage and from contact with the epoxy grout droppings. Use proven methods as appropriate to the surface being protected, and as approved by the Engineer before the procedures are initiated.
2. Protect the public and active contiguous areas from dust, spillage, and debris resulting from work of this section.
   a. If required, use fire-resistant dustproof tarps, tightly secured against dust leakage, as approved by the Engineer. Do not use water sprays or water mist methods to control the dust.
   b. Provide exhaust ventilation if necessary to prevent dust and fumes from reaching the public and active contiguous areas.
   c. Provide methods and procedures to ensure that the work of this section is isolated from the public and active contiguous areas.
3. Control and collect spillage from repair operations.
4. Maintain protection in place until completion of work.

D. Surface Preparation: Using only small hand tools and 1-hand power tools chip away unsound concrete to reach a sound substrate. Minimum depth of cut shall be within the limitations of the requirements of the patching material to be used. Where rusty reinforcing bars are encountered, fully expose the rusted portions and remove all surface rust by wire-brushing (do not brush to bright metal). Expose and brush the entire circumference of the bars and use Sika Armatec 110 Epocen substrate primer as manufactured by Sika Corporation, Lyndhurst, NJ or approved equal after cleaning.

3.2 INSTALLATION

A. General: Follow procedures and methods demonstrated by the accepted mock-ups.

B. Cracks:
1. Inject epoxy grout into cracks under pressure using equipment appropriate for particular application in accordance with the manufacturer's instructions.
2. Begin injection at far side of crack and continue until grout is forced to the front. Continue along length of crack until entire crack is filled.
3. Remove excessive grout.
4. Clean surfaces adjacent to repair and blend finish.

C. Reinforcement Repair:
1. Where portions of the exposed reinforcing bar has lost 25 percent of its cross-sectional area at any point, mechanically cut away that portion of the bar. Do not use torches for cutting.
2. Provide new replacement reinforcing of appropriate diameter and length. Butt-weld ends of bars, or fillet weld 30-bar-diameter splice overlap to connect replacement segment with existing portions to remain, or lap as shown in the Contract Drawings.

D. Concrete Patching:
   1. Apply bonding agent onto prepared substrate surfaces, as required by repair mortar to be used.
   2. Patch concrete pockets, spalls, etc. with repair mortar to effect a flush surface condition. Perform application and curing per the manufacturer's product data of the actual material being used.

E. Finishing: Finish repair to match existing adjacent concrete.

F. Unacceptable repairs: Cracking within the repair or separation at the edge of the repair is unacceptable. Replace all repairs that exhibit cracking or separation, or that does not meet the standards of the accepted mock-ups.

3.3 ADJUSTING AND CLEANING

A. Repair and refinish surfaces damaged in executing the work. Make repairs as directed by the Engineer.

B. Cleaning: Remove materials, tools, and debris; leave all work areas in broom-clean condition.

C. Protection: Remove protective materials.

END OF SECTION

SECTION 03 93 10 – DRILLING AND GROUTING REINFORCING BARS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Work under this section consists of furnishing all labor, material, and equipment required for drilling, coring or core-drilling a combination of coring and drilling of holes in the existing structure and grouting reinforcing bars into the holes. All work shall be as shown on the Contract Drawings and as specified herein or as directed by the Engineer.

1.2 SUBMITTALS

A. The Contractor shall submit producers or manufacturer's specifications and installation instructions.

1.3 REFERENCES

Unless otherwise noted, the latest edition of the following codes and standards shall govern this work. If any conflicts exist between these codes and standards the more restrictive requirements shall govern.

A. American Railway Engineering and Maintenance of Way Association (AREMA)

B. American Concrete Institute (ACI)

1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.

2. ACI 301 - Specifications for Structural Concrete for Buildings.

3. ACI 304 - Guide for Measuring, Mixing, Transporting and Placing Concrete.

4. ACI 305R - Hot Weather Concreting.

5. ACI 306R - Cold Weather Concreting.

6. ACI 318 - Building Code Requirements for Reinforced Concrete.

7. Other ACI recommended practices shall be followed where applicable except as may be specifically deviated elsewhere in this specification.

C. American Society for Testing and Materials (ASTM)

1. ASTM C31 - Test Methods of Making and Curing Concrete Test Specimens in the Field.

2. ASTM C33 - Specification for Concrete Aggregates.

3. ASTM C39 - Test Method for Compressive Strength of Cylindrical Concrete Specimens.

4. ASTM C94 - Specification for Ready-mixed Concrete.

5. ASTM C138 - Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.

6. ASTM C143 - Test Method for Slump of Hydraulic Cement Concrete.

7. ASTM C150 - Specification for Portland Cement.

8. ASTM C171 - Specification for Sheet Materials for Curing Concrete.

9. ASTM C192 - Test Method of Making and Curing Concrete Test Specimens in the Laboratory.

10. ASTM C260 - Specification for Air-Entraining Admixtures for Concrete.

11. ASTM C309 - Specification for Liquid Membrane-forming Compounds for Curing Concrete.

12. ASTM C494 - Specification for Chemical Admixtures for Concrete.

13. ASTM C685 - Specification for Concrete Made by Volumetric Batching and Continuous Mixing.

14. ASTM C920 - Specification for Elastomeric Joint Sealants.

15. Other ASTM specifications shall be followed where applicable except as may be specified elsewhere in this specification.

D. New York State Department of Transportation Standard Specifications, Construction and Materials.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Non-shrink, non-staining grout. The grout mix shall consist of a mixture of hydraulic cement, water, fine aggregates, and expansive admixture approved by the Engineer. The grout mix shall conform to the following requirements.

1. The grout mix shall exhibit no shrinkage on setting but may exhibit slight expansion of no more than 3% when tested by methods conforming to the requirements of ASTM C 827.

2. The grout mix shall have minimum 7 days compressive strength of 5,000 psi, when tested by methods conforming to the requirements of ASTM C 109, except that the materials and the proportions of materials shall conform to the Contractor's design.

3. The water content of the grout shall be kept as low as possible for proper grouting. However, it shall not exceed 5 gallons per sack of cement. The water shall be potable.

B. Portland cement shall be Type I, II or III cement in conformance with AREMA Chapter 8, Part 14, Article 14.4.1.

C. Fine aggregate shall conform to the requirements of Article 1.3.2 in AREMA Chapter 8, Part 1.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Holes shall be drilled and shall be of the size and depth shown on the Contract Drawings. If existing reinforcing bars are encountered during the drilling or coring operation, the hole shall be relocated to clear the existing reinforcing bars as directed by the Engineer and the previous hole grouted in accordance with this specification. Care shall be taken not to damage exposed reinforcing bars. The Contractor is fully responsible for the type of drilling equipment used and as a result any damage inflicted on the existing structure shall be repaired by the Contractor at no extra cost to Metro-North.

B. Each finished hole shall be blown clean with an air jet then flushed with a jet of clean water. In the water-flushing operation the pressure hose shall be extended to the bottom of the hole several times and withdrawn gradually each time. After flushing, the vertical holes shall be left full of clean water for a period of 6 hours. Immediately before the grouting operation on a hole all water shall be removed from it and the free water on the wall of the hole shall be removed with an air jet or by the use of clean rags.

C. The grout shall be mixed and placed strictly in accordance with the recommendations of the manufacturer. The grout shall completely fill the space around the reinforcing bar. Particular care shall be taken to conform to the manufacturer's specified time limit within which the grout must be placed after mixing. Grout that has begun to stiffen shall under no circumstances be retempered by adding water and remixing. Such grout shall be discarded.

D. If the grout shall be made sufficiently flowable without exceeding the manufacturer's recommended water content, the bar may be pushed into the holes which have received enough grout so that the grout will be displaced to the top of the holes. Otherwise, a

smaller amount of grout shall be placed in the holes, the bar entered, and the holes filled with grout. The Contractor shall provide an approved means of keeping the bar centered in the tops and bottoms of the holes until the grout has thoroughly hardened.

END OF SECTION

SECTION 04 22 00 - CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Concrete masonry units
   2. Decorative concrete masonry units.
   3. Mortar and grout.
   4. Steel reinforcing bars.
   5. Masonry-joint reinforcement.
   6. Embedded flashing.
   7. Miscellaneous masonry accessories.
   8. Masonry-cell fill.

B. Related Requirements:
   1. Section 05 10 00 "Structural Metal Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
   2. Section 05 50 00 “Metal Fabrication”
   3. Section 07 60 00 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
   4. Section 09 96 23 “Graffiti resistance coatings”

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315

C. Samples for Initial Selection:
   1. Decorative CMUs, in the form of small-scale units.
   2. Colored mortar.
   3. Weep holes/vents.

D. Samples for Verification: For each type and color of the following:
   1. Decorative CMUs.
   2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:
   1. Masonry units.
      a. Include data on material properties
   2. Integral water repellant used in CMUs.
   3. Cementitious materials. Include name of manufacturer, brand name, and type.
   4. Mortar admixtures.
   5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
   6. Grout mixes. Include description of type and proportions of ingredients.
   7. Reinforcing bars.
   8. Joint reinforcement.
   9. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
   2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

D. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
   1. Build sample panels for typical exterior wall in sizes approximately 48 inches long by 36 inches high
   2. Build sample panels facing south.
   3. Where masonry is to match existing, build panels adjacent and parallel to existing surface.
   4. Protect approved sample panels from the elements with weather-resistant membrane.
   5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
      a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless Architect specifically approves such deviations in writing.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Protect accepted mockups from the elements with weather-resistant membrane.
   2. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
      a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
      b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
   1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction

2.3 CONCRETE MASONRY UNITS

A. Regional Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide square-edged units for outside corners unless otherwise indicated.

C. Integral Water Repellent: Provide units made with integral water repellent where indicated.
   1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514/E 514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

D. CMUs: ASTM C 90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi
   2. Density Classification: Normal weight unless otherwise indicated.
   3. Size 8”: Manufactured to dimensions 3/8 inch less than nominal dimensions.
   4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

E. Decorative CMUs: ASTM C 90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi
   2. Density Classification: Medium weight
   3. Size (Width): Manufactured to dimensions specified in "CMUs" Paragraph.
   4. Pattern and Texture:
      a. Standard pattern, ground-face finish
      b. Match Architect's samples.
   5. Colors: As selected by Architect from manufacturer's full range

2.4 MASONRY LINTELS

A. General: Provide one of the following:

B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 MORTAR AND GROUT MATERIALS

A. Regional Materials: Aggregate for mortar and grout shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

B. Masonry Cement: ASTM C 91/C 91M.
   1. EssRoc
   2. Lafarge
   3. Holcim

C. Colored Cement Products: Packaged blend made from masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
   1. Colored Masonry Cement:
      a. EssRoc
      b. Lafarge
      c. Holcim
   2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
   3. Pigments shall not exceed 5 percent of masonry cement by weight.

D. Aggregate for Mortar: ASTM C 144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
   3. White-Mortar Aggregates: Natural white sand or crushed white stone.
   4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Aggregate for Grout: ASTM C 404.

F. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A 951/A 951M.
   1. Exterior Walls: Hot-dip galvanized carbon steel.
   2. Wire Size for Side Rods: 0.148-inch diameter.
   3. Wire Size for Cross Rods: 0.148-inch diameter.
   4. Spacing of Cross Rods: Not more than 16 inches o.c.
   5. Provide in lengths of not less than 10 feet

2.7 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
   1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
   2. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch diameter, hot-dip galvanized steel wire
   2. Tie Section: Triangular-shaped wire tie made from 0.187-inch diameter, hot-dip galvanized steel wire.

D. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 made from 0.060-inch-thick steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete.

E. Partition Top Anchors: 0.105-inch- thick metal plate with a 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication
   1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

2.9 MASONRY-CELL FILL

A. Loose-Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).

B. Lightweight-Aggregate Fill: ASTM C 331/C 331M.

2.10 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use masonry cement mortar unless otherwise indicated.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated
   1. For masonry below grade or in contact with earth, use Type S.
   2. For reinforced masonry, use Type S
   3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.

D. Pigmented Mortar: Use colored cement product
   1. Pigments shall not exceed 5 percent of masonry cement by weight.
   2. Mix to match Architect's sample.
   3. Application: Use pigmented mortar for exposed mortar joints with the following units:
      a. Decorative CMUs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:
1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels
1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.

7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:
   1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch with a maximum thickness limited to 1/2 inch
   2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch
   3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch
   4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

H. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.
   2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.

3. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:
   1. Bed face shells in mortar and make head joints of depth equal to bed joints.
   2. Bed webs in mortar in all courses of piers, columns, and pilasters.
   3. Bed webs in mortar in grouted masonry, including starting course on footings.
   4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
   1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
   2. Wet joint surfaces thoroughly before applying mortar.
   3. Rake out mortar joints for pointing with sealant.

D. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch (6 mm) and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

G. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.6 MASONRY-CELL FILL

A. Pour loose-fill insulation into cavities to fill void spaces. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than 20 feet.

B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.7 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
   3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at corners by using prefabricated L-shaped units.

D. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
   1. Provide an open space not less than **1/2 inch** wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.9 LINTELS

A. Provide **masonry** lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 FLASHING

A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall where indicated.

B. Install flashing as follows unless otherwise indicated:
   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape
   2. At lintels, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.

3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
4. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

C. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

D. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength

E. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

F. Prism Test: For each type of construction provided, according to ASTM C 1314 at 28 days.

3.12 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
   1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
   2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
   3. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.13 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 05 10 00 - STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section specifies furnishing and constructing steel structures in accordance with the details indicated on the Contract Drawings.

1.2 REFERENCES

A. Reference Standards:
   1. American Institute of Steel Construction (AISC).
      a. AISC Code of Standard Practice for Steel Buildings and Bridges.
      b. AISC Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design.
      c. AISC Specification for Structural Joints Using ASTM A325 Bolts.
   2. American National Standards Institute:
      a. ANSI B18.2.1, Square and Hex Bolts and Screws - Inch Series.
      b. ANSI/ASME B18.2.2, Square and Hex Nuts - Inch Series.
      c. ANSI B18.22.1, Plain Washers.
   3. Federal Specifications (FS):
      a. FF-S-325, Shield, Expansion; Nail Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry).
      b. FF-W-84A, Washers, Lock (Spring).
      c. FF-W-92B, Washer, Flat (Plain).
   4. American Society for Testing and Materials (ASTM):
      a. A6, Specification for General Requirements for Rolled Steel Bars, Plates, Shapes, and Sheet Piling.
      b. A36, Specification for Carbon Structural Steel.
      c. A123, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
      d. A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
      e. A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
      f. A320, Specification for Alloy Steel Bolting Materials for Low-Temperature Service.
      g. A325, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
      h. F436, Specification for Hardened Steel Washers.
      i. A572, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
      j. A992, Standard Specification for Structural Steel Shapes
      k. E164, Ultrasonic Contract Examination of Weldment
      l. E709, Practice for Magnetic Particle Examination
   5. American Welding Society (AWS): ANSI/AWS D1.1 Structural Welding Code (2000).

1.3 SUBMITTALS

A. Submit the following:
   1. Shop Drawings:
      a. Show all shop and erection details including welding technique and sequence, cuts, copes, gussets and all other members, connections, holes, fasteners, camber, fabrication and erection tolerances, type of paint system or other coating, weights of members, length of member, length of span, elevations and critical clearances. Indicate all surface finishes and welds, both shop and field, by symbols conforming to ANSI/AWS Standards. Shop drawings and connection design calculations shall be sealed by a Professional Engineer licensed in New York.
   2. Furnish setting diagrams, for the installation of structural framing anchor bolts, bearing plates, and other embedded items.
   3. Welding Records and Data:
      a. Prior to commencing any work requiring welding, submit the procedure that will be used for prequalifying welders and welding procedures. For all procedures other than those set forth in paragraph 5.1 of ANSI/AWS D1.1 submit a copy of procedure qualification test records.
      b. Submit certified copy of qualification test record for each welder, welding operator, and tacker who will be employed in the work.
      c. Submit data reports of the results of nondestructive inspection tests of shop welds to the Engineer.
         1) Indicate the type and location of shop welds tested, type and location of defects noted, measures taken to correct the defects, and the test results of corrected welds.
         2) Report any defective welds that are not corrected.
   4. Certified copy of reports for all analyses and tests required by referenced ASTM Specifications, including test reports for filler metals for welding, and mechanical tests for high strength threaded fasteners and shear connectors.
   5. Product data, including laboratory test reports and other data required to demonstrate conformance to specified requirements for:
      a. Structural steel, including certified copies of mill reports covering chemical and physical properties.
      b. Anchor bolts and nuts.

1.4 QUALITY CONTROL

A. Qualifications:
   1. Fabricator: Company experienced in fabricating structural steel similar to that indicated for the project who has a successful in-service performance for a minimum of 5 continuous years and sufficient production capacity.
      a. Fabricator must participate in the AISC Quality Certification Program and designated an AISC Certified Plant with conventional steel building structure or building standard.

B. Erector: Company experienced in erecting structural steel work similar to that indicated for the project who has a successful in-service performance with a minimum of 5 continuous years of experience.

C. Welder, Tacker and Welding Operator Qualifications: Use welders, tackers and welding operators who have been previously qualified by tests as prescribed in the Structural Welding Code, AWS D1.1 of the American Welding Society, to perform type of work required. Welders and inspectors shall be currently certified by AWS.

D. Comply with applicable provisions listed in those references stated in Article 1.02 of this specification unless otherwise indicated.

E. Materials and fabrication procedures are subject to inspection and tests in mill, shop and field by a qualified inspection agency. Such inspections and tests will not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

F. Promptly remove and replace materials or fabricated components that do not comply.
   1. All AESS fabrications shall be inspected in the shop prior to the shipment of those materials to the field.

1.5 DELIVERY, HANDLING AND STORAGE

A. Exercise care to avoid bending, scraping, and overstressing the steelwork. Block with wood, or otherwise protect, projecting parts likely to be bent or injured.

B. For members with gross shipping weight greater than 5 ton, mark weight on member. Match-mark all shop pre-fitted members.

C. Ship small parts, such as bolts, nuts, washers, direct tension indicators, pins, fills, and small connecting plates and anchors, in boxes, crates, or barrels. Pack separately each length and diameter of bolt and each size of nut and washer. Plainly mark in itemized list and description of the contents on the outside of each container.

D. Load, transport, unload, and store structural material in such a manner that the metal is kept clean and free from injury. Store material above ground on platforms, skids, or other supports, and cover and protect it from corrosion.

E. Identify all materials by heat and lot, if applicable.

F. Replace pieces bent or damaged unless repairs are authorized by the Engineer.

G. Ensure uninterrupted delivery of material for continuous progress of the Work.

1.6 COORDINATION

A. Prior to shop painting, coordinate with fire-proofing products manufacturer to verify if steel members indicated to be fireproofed, should also be prime painted, and notify the steel fabricator.

PART 2 - PRODUCTS

2.1 PLATES, SHAPES, AND BARS

A. High Strength Steel: ASTM A572, Grade 50 or ASTM A992, Grade 50, shall be used for all steel shapes.

B. Structural Pipe: ASTM A53.

C. Structural tubing: ASTM A500 Grade B.

D. Structural plates: ASTM A36.

2.2 SHEAR CONNECTORS

A. Headed Stud Type Shear Connectors: Cold finished carbon steel units conforming to ASTM A108. Provide Shear Connectors by Nelson Studs Welding Systems, or approved equal.

2.3 FASTENERS

A. General:
   1. Provide fasteners of type, grade, and class required for the particular use.
   2. Square and hex bolts and nuts shall conform to applicable dimensional requirements of ANSI B18.2.1 for bolts and ANSI/ASME B18.2.2 for nuts.

B. Bolts:
   1. Standard Steel Bolts: ASTM A325, with ¾" diameter, unless noted otherwise.
   2. Carbon Steel Nuts: ASTM A563, Grade A.
   3. Washers:
      a. Plain Washers: Round, carbon steel, FS FF-W-92 or ANSI B18.22.1.
      b. Lock Washers: Helical spring type, carbon steel, FS FF-W-84.
      c. Beveled Washers: ASTM F436.
   4. Stainless Steel Bolts, Nuts and Washers: ASTM A320, Grade B8, AISC Type 304.
   5. Carbon and Alloy Steel Nuts: ASTM A563.
   6. Hardened Steel Washers: ASTM F436.

C. Adhesive Anchors: Composed of an anchor rod assembly and an anchor rod adhesive cartridge:
   1. Anchor Rod Assembly: Chamfered end threaded stud rod, with nut and washer.
   2. Adhesive Cartridge: Sealed capsule containing pre-measured amounts of resin, quartz and aggregate, and a hardener contained in a separate vial within the capsule. Capsule ingredients activated by the insertion procedure of the anchor rod assembly.

D. Masonry Anchorage Devices (Expansion Anchors): FS FF-S-325, Group II, Type 4, Class 1 (stainless steel where specifically called for on Contract Drawings); embed 4 1/2 bolt diameters minimum or as indicated on the Contract Drawings.

E. Anchor Bolts: ASTM A36, or ASTM F1554

2.4 GROUT AND DRY-PACK MATERIAL

A. Non-shrink, Non-Metallic Grout: As specified in Section 03 60 00.

2.5 PROTECTIVE COATINGS

A. Coating for Interior Steel:
   1. Primer: Rust inhibiting, made for priming under alkyd enamel, VOC compliant.

B. Coating for all other steel - See Section 09 90 00.

2.6 ELECTRODES

A. Use low-hydrogen electrodes for field welding.

B. Electrodes for Structural Plate, Shapes, Pipe, Tubes, and Bars: Conform with ANSI/AWS A5 Series Standards and be coated rods or wire of size and classification number as recommended by their manufacturers for the positions and other conditions of actual use. Matching filler metal requirements shall conform to ANSI/AWS D1.1, Table 3.1., E70XX.

C. Electrodes for Sheet Steel: Conform to Article 2.06.A. above except matching filler metal shall conform to ANSI/AWS D1.3, Table 5.1.

PART 3 - EXECUTION

3.1 FABRICATION

A. General: Fabricate and shop-assemble work in accordance with AISC Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design; AISC Specification for Structural Joints Using ASTM A325 S.C. ; AISC Code of Standard Practice for Steel Buildings and Bridges; and AISC Manual of Steel Construction - Allowable Stress Design.

B. Straighten rolled material, if necessary, before it is laid out for fabrication, in a manner conforming to the mill tolerances provided in ASTM A6/A6M, and by a process and in a manner which will not injure the material. Sharp kinks and bends will be cause for rejection of the material. Straighten, plane, and otherwise correct portions of members in bearing assemblies and in direct bearing after those members have been fabricated.

C. Perform shearing, flame cutting, and chipping carefully and accurately so as not to induce residual stress in the metal being cut. The radii of re-entrant gas-cut fillets shall be not less than (3/4 inch) and as much larger as practicable. Perform flame cuttings in such manner that metal being cut is not carrying stress. Exposed edges, flame-cut by hand, shall be finished by grinding.

D. Fabricate bearing stiffeners and stiffeners intended as supports for concentrated loads to have full bearing on the flanges. Mill or grind bearing surfaces of these stiffeners. Such stiffeners may be welded as indicated on the Contract Drawings.

E. The radius of bend, measured to the concave face of the metal, shall conform to AISC Manual of Steel Construction, Part 4.

F. Planning and Facing:
   1. Fabricate floor beams, stringers and girders having end connection angles to exact length back to back of connection angles.

G. Connections:
   1. Except where welded or ASTM A307 bolted connections are shown, use ASTM A325 bolts for all shop and field connections.
   2. Bolt field connections in bearing-type connections using ASTM A325 bolts, nuts and hardened washers in accordance with AISC specifications.
   3. Bolt field connections in slip-critical connections using ASTM A325 bolts, nuts and direct tension indicators, or tension control bolts.

H. Bolt Holes: Punch, drill, subpunch, subdrill and ream holes for bolts as required in accordance with AISC Specifications.

I. Welding: Perform all welding in accordance with ANSI/AWS D1.1

J. Bolting:
   1. For connections using high-strength steel bolts, conform to requirements of AISC Specifications.
   2. Assemble high-strength bolted parts so that they fit solidly together when assembled. Do not use gaskets or any other interposed compressible materials.
   3. Remove scale, dirt, butts and other defects liable to prevent proper seating when assembling joint surfaces, including those adjacent to washers.
   4. Clean off oil, paint or lacquer from contact surfaces of friction-type joints.
   5. For bearing-type connections, tighten the A325 bolts to a snug tight condition achieved by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench to the extent that all plies of the connected material have been brought into snug contact.
   6. For slip-critical type connections, tighten the A325 bolts as specified in the AISC Specification for Structural Joints Using A325, 1985, Subsection 8 (d) (1).
   7. Arrange bolts so that heads show in areas exposed to view.

K. Shop Painting:
   1. Surface Preparation: Hand Tool Cleaning – SSPC-SP2, or Power Tool Cleaning - SSPC-SP 3, per manufacturer’s recommendation.
   2. Apply one shop coat of primer paint to structural steel in accordance with manufacturer's recommended procedures at mil thickness specified in Section 09900.
   3. Apply only a primer coat onto faying surfaces, for bearing – type connections

3.2 ERECTION

A. Erect steel members true and plumb following the match marks and in accordance with the Drawings, pertinent regulations and referenced AISC standards.
   1. Allow concrete foundations to reach a minimum of 14-days curing time and 90% of specified design strength before erecting steel and torqueing anchor bolts.

B. Report immediately to the Engineer, errors in shop fabrication or deformation resulting from handling or transportation that prevent the proper erection and fitting of parts.

C. Thoroughly clean surfaces to be joined.

D. Install anchor bolts accurately in position shown.
   1. If anchor bolts are cast in substructure when it is being constructed, ensure that they are firmly held in their correct position and elevation by suitable templates.
   2. If approval is given, by the Engineer, for installing anchor bolts in preformed holes or in drilled holes in concrete or masonry, use approved epoxy adhesion anchor system for securing them in place.

E. Align column bases and bearing plates for beams and similar structural members with steel wedges, shims or leveling washer and nut. After the supported members have been aligned and properly positioned and the anchor nuts have been tightened, dry-pack the entire area under bearing plates with grout.

F. Use temporary bracing to resist loads to which the structures may be subjected including erection equipment or the operations of same. Leave bracing in place as long as may be required for safety, and until the wind-force resisting system (shear walls or frames) is constructed.

G. Field Assembly:
   1. Splice only where indicated.
   2. Align and adjust members forming parts of a complete assembly after assembly and before fastening.
   3. Fasten splices of compression members after the abutting surfaces have been brought completely into contact.

H. As erection progresses, perform sufficient bolting of the work to support dead load, and wind and erection loads. Perform permanent bolting when enough alignment has been done to ensure as much of the structure as possible will be supported by such fastening work.
   1. Ensure that holes are not enlarged and that the metal in the vicinity of the holes is not disturbed by the drifting occurring during assembly.
   2. Enlarge holes to admit bolts for connections only if approved by the Engineer. Make the enlargement by reaming and not by burning. Avoid hand reaming.
   3. Erection bolts used in welded construction shall be tightened securely and left in place.

I. Do not weld main stress members in the field except as indicated on the Contract Drawings.

J. Adhesive Anchor Installation:
   1. Install adhesive anchors in strict accordance with manufacturer's instructions.
   2. Following cartridge installation in prepared drill holes, set anchor rod to the required depth. Set anchor rods truly perpendicular (normal) to the base plate of item being anchored.
   3. Minimum Embedment Table (Concrete):

Diameter (in)	3/8	½	5/8	¾	7/8	1
Embedment Depth (in)	3-1/2	4-1/4	5	6-5/8	6-5/8	8-1/4

3.3 QUALITY ASSURANCE TESTING

A. Provide an independent Quality Assurance Testing and Inspection Agency approved by the Engineer to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

B. The Quality Assurance Testing Agency shall conduct and interpret tests, state in each report whether test specimens comply with requirements, and specifically state any deviations there from.

C. Provide access for the Quality Assurance Testing Agency to places where structural steel work is being fabricated or produced so required inspection and testing can be accomplished.

D. The Quality Assurance Testing Agency may inspect structural steel at plant before shipment.
   1. Shop-Bolted Connections: The Quality Assurance Testing Agency will inspect or test in accordance with AISC specifications, and the RCSC's "Specification for Structural Joints Using ASTM A 325 Bolts." Verify proper fastening components were used and the connected elements were fabricated properly.
   2. Slip-critical and pretension connections: Test 2 bolts per connection.
   3. Shop Welding: The Quality Assurance Testing Agency will inspect and test during fabrication of structural steel assemblies, as follows:
      a. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
      b. Perform visual inspection of full length of all welds. In addition to visual inspection of shop-welded connections, welds will be inspected and tested according to AWS D1.1 and the inspection procedures listed below:
         1) Complete penetration welds: Ultrasonic Inspection; ASTM E 164.
         2) Fillet welds: Magnetic Particle Method; ASTM E709. Perform ultrasonic testing of the entire length of full penetration welds for the following:
         3) Rigid (moment) frame flange connection plates on columns; test fifty (50%) percent of tension plates and twenty (20%) of compression plates.
         4) 10% of all other groove and full-penetration welds.
         5) Perform magnetic particle testing on the entire length of fillet welds as follows: Gusset Plate for bracing to Steel Member: 20% of fillet weld locations. Other locations: 5% of fillet welds.
      c. Field-Bolted Connections: The Quality Assurance Testing Agency will inspect and test field-bolted connections in accordance with AISC specifications and RCSC's "Specification for Structural Joints Using ASTM A 325 Bolts" and the following: Verify proper fastening components were used and the connected elements were fabricated properly.
      d. Slip-critical and pretension connections: Test 2 bolts per connection.
   4. Field Welding: The Quality Assurance Testing Agency will inspect and test during erection of structural steel as follows:

      Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
         1) Perform visual inspection of full length of all welds. In addition to visual inspection of shop-welded connections, welds will be inspected and tested according to AWS D1.1 and the inspection procedures listed below:
         2) Complete penetration welds: Ultrasonic Inspection; ASTM E 164.

3) Fillet welds: Magnetic Particle Method; ASTM. Perform ultrasonic testing of the entire length of complete penetration welds for the following:
4) Rigid (moment) frame flange connection plates on columns; test all welds.
5) 20% of all other groove and full-penetration welds.
6) Perform magnetic particle testing on the entire length of fillet welds as follows:
   a) Beam connection plate (angles) to embedded plate in concrete: test all welds.
   b) Diagonal bracing member to gusset: 40% of fillet weld locations.
   c) Gusset plate for bracing to steel member: 40% of fillet weld locations.
   d) 10% of all other fillet welds

5. Welding of rigid frame flange connection plates on columns shall be done in the field only if required for ease of erection. This field welding, if required, shall be clearly indicated on the shop drawings.

E. The Quality Assurance Testing Agency will confirm that the structure is square, plumb, and level in accordance with AISC and AESS tolerances.

1. Remove and replace work that does not comply with specified requirements.
   a. The Prime Contractor shall correct deficiencies in structural steel work that inspections
   b. and test reports have indicated to be not in compliance with requirements. The Quality
   c. Assurance Testing Agency will perform additional tests, at the Prime Contractor's
   d. expense, as necessary to reconfirm any noncompliance of original work and to show
   e. compliance of corrected work.

3.4 FIELD TOUCH-UP PAINTING

A. General: Paint bolt heads and nuts, field welds and areas within 2 inches of welds and touch up abrasions in the shop coat.

B. Surface Preparation: Use methods at least as effective as those specified for the structure itself but in no case less than SSPC-SP 3 for removal of handling marks and SSPC-SP 6 for areas showing rust.

C. Paint: Use those individual products as specified for Shop Paint.

END OF SECTION

SECTION 05 30 00 - METAL DECKING

PART 1 - GENERAL

1.1 Section Includes:

A. Requirements for furnishing and installing steel decking at locations indicated on the Drawings.

1.2 RELATED sections:

A. SECTION 01 33 00 Submittal Procedures.

1.3 REFERENCES:

A. American Iron and Steel Institute (AISI):
   1. AISI North American Specification for the Design of Cold-Formed Steel Structural Members.

B. American Society for Testing and Materials (ASTM):
   1. ASTM A 108; Standard Specification for Steel Bars, Carbon and Alloy, Cold-Finished.
   2. ASTM A 653/A 653M; Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   3. ASTM A 780; Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
   4. ASTM A 924/ A 924M; Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
   5. ASTM E 329, Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

C. American Welding Society (AWS):
   1. AWS D1.1/D1.1M Structural Welding Code - Steel.
   2. ANSI/AWS D1.3; Structural Welding Code - Sheet Steel.

D. Steel Deck Institute (SDI):
   1. SDI 30, Design Manual for Composite Decks, Form Decks and Roof Decks.

E. Occupational Safety and Health Administration (OSHA):
   1. Code of Federal Regulations (CFR):
      a. 29 CFR Part 1926.754 Structural Steel Assembly.
         1) OSHA Directive Number CPL 02-01-034 Inspection Policy and Procedures for OSHA's Steel Erection Standards for Construction.

1.4 SUBMITTALS

A. Submit the following information for approval in accordance with the requirements of Terms and Conditions:
   1. Product Data:
      a. Manufacturer's specifications for each product specified:
         1) Steel floor deck.
         2) Mechanical fasteners.
         3) Rib closure strips.
         4) Pour stops and girder fillers.
         5) Column Closures, End Closures, Z-Closures, and Cover Plates.
         6) Galvanizing repair paint.
         7) Preset inserts.
         8) Headed stud type shear connectors (studs).
   2. Shop Drawings:
      a. Detailed drawings showing the layout of deck panels; anchorage details; and every condition requiring closure panels, special jointing, or other accessories.
   3. Quality Assurance/Quality Control Submittals:
      a. Test Reports:
         1) Inspection and testing reports from the Independent Quality Assurance Testing and Inspection agency.
      b. Certificates:
         1) Manufacturer's Certification per Subparagraph 1.05.C.1.
         2) Steel Certificate per Subparagraph 1.05.C.2.
      c. Manufacturer's Instructions:
         1) Manufacturer's installation instructions for each product specified.
      d. Qualification Statements:
         1) Welder Certificates: Submit certificates certifying welders per Subparagraph 1.05.A.2.

1.5 QUALITY REQUIREMENTS:

A. Qualifications:
   1. Installer Qualifications: Engage an experienced Installer who has completed steel deck similar in material, design, and extent to that indicated for this Contract, and which exhibits a record of successful in-service performance.
   2. Welder Certification: Certify that each welder employed on the work has satisfactorily passed AWS qualification tests within the last twelve months for the welding processes involved and, if pertinent, has undergone recertification.
   3. Independent Quality Assurance Testing and Inspection Agency Qualifications:
      a. Employ an independent quality assurance testing and inspection agency qualified to perform the inspections and testing required by this Section.
      b. The independent quality assurance testing and inspection agency must conform to the quality standards of the nationally recognized associations and agencies that promulgate the test standards, particularly ASTM E 329.

c. Materials and fabrication procedures are subject to inspection and testing in the mill, shop, and field by the independent quality assurance testing and inspection agency.
   1) Direct the independent quality assurance testing and inspection agency to submit certified written reports that document the results of all tests and inspections performed directly to the Engineer immediately after the work is performed.
      a) In the reports, state whether the tested and inspected items comply with specified requirements or deviate from them.
      b) Submit a certified copy of the reports for all analyses and tests required by the ASTM Specifications referenced in Paragraph 1.02.B, including test reports for filler metals for welding and mechanical tests for high-strength threaded fasteners.
   2) Inspections and tests performed by the quality assurance testing and inspection agency do not relieve the Contractor of responsibility for providing materials and fabrication procedures in compliance with specified requirements.

B. Regulatory Requirements:
   1. Comply with the provisions of 29CFR Part 1926.754 Structural Steel Assembly, and related OSHA Directive Number CPL 02-01-034 [Old Directive Number CPL 2-1.34].

C. Certifications:
   1. Manufacturer's Certification: Submit a manufacturer's certification certifying that the Work performed under this Section complies with the specified requirements.
   2. Steel Certificate: Submit a certificate certifying that all steel used for this project is American produced.
   3. Recycled Content Affidavits: Submit written affidavits from the steel deck manufacturer indicating the percentage of post-industrial recycled content and post-consumer recycled content in the steel deck.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Storage and Protection:
   1. Store decking on platforms, skids, blocking or other supports with one end elevated.
   2. Protect decking from weather with non-asphaltic waterproof covering, adequately ventilated to prevent condensation.
   3. Exercise care so as not to damage decking during handling or rigging.
      a. Do not use decking for bulk storage or as a working platform for other construction materials.
      b. Exercise care so as not to overload decking during installation and during the entire construction period.
      c. Do not place deck bundles on unbolted building frames.
   4. During installation, do not locate bundles of uninstalled decking where they will overload supporting members.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Roof Deck:

B. Steel Roof Deck:
1. Galvanized-Steel Sheet: Provide steel sheet classified as Grade 33 or higher Structural Steel (SS) with Coating Designation G 60 per ASTM A 653/A 653M, and zinc coated according to ASTM A 924/A 924M.
2. Deck Profile and Depth: Provide Type WR, wide rib deck, 1-1/2 inches deep.
3. Design Uncoated-Steel Thickness: 0.0358-inch.
4. Provide roof deck units in lengths capable of spanning 3 or more supports, and designed with overlapping side joints, unless otherwise indicated.

2.2 Accessories:

A. Provide accessory materials for steel deck that comply with the requirements indicated and the recommendations of the steel deck manufacturer.
1. Mechanical Fasteners:
   a. Provide the manufacturer's standard, corrosion-resistant, low-velocity, powder-actuated or pneumatically driven carbon steel fasteners; or self-drilling, self-threading screws.
2. Rib Closure Strips:
   a. Provide the manufacturer's standard vulcanized, closed-cell, synthetic rubber rib closure strips.
3. Pour Stops and Girder Fillers:
   a. Provide pour stops and girder fillers fabricated from the same steel sheet material as the deck panels, and of the thickness and profile indicated.
4. Column Closures, End Closures, Z-Closures, and Cover Plates:
   a. Provide column closures, end closures, Z-closures, and cover plates fabricated from the same steel sheet material and thickness as the deck panels, unless otherwise indicated.
5. Weld Washers:
   a. Provide the manufacturer's standard uncoated-steel sheet weld washers, shaped to fit the deck rib.
   b. Washer Thickness: 0.0598-inch.
   c. Pre-punched Hole Diameter: 3/8-inch, minimum.
6. Galvanizing Repair Paint:
   a. Provide high zinc-dust content paint complying with the requirements of ASTM A 780 to repair damaged galvanized surfaces.
7. Preset Inserts:
   a. Provide the manufacturer's standard, single-piece preset inserts with removable covers.

b. Fabricate preset inserts from either zinc sheet or steel sheet galvanized according to ASTM A 924/A 924M, G 60 coating class.

B. Headed Stud Type Shear Connectors (Studs):
1. Provide headed stud type shear connectors (studs) meeting the requirements of ASTM A 108.

2.3 FABRICATION

A. Fabricate roof and floor panels in conformance with the requirements of SDI 30:
1. Fabricate steel composite floor deck panels with integrally embossed or raised pattern ribs and interlocking side laps, and having at a minimum the section properties indicated.
2. Weld studs in accordance with AWS D1.1/D1.1M, Section 7; and provide welds meeting the mechanical properties for welded Type B studs in Table 7.1.

B. Provide decking free of lubricants and oils which would impair the adhesion of spray-on fireproofing.

C. Accessories:
1. Accessories: Fabricate steel sheet accessories from steel sheet classified as Grade 33 or higher Structural Steel (SS) with Coating Designation G 60 per ASTM A 653/A 653M, and zinc coated according to ASTM A 924/A 924M.

PART 3 - EXECUTION

3.1 Preparation

A. Examine the deck support framing and other field conditions for compliance with the specified installation tolerances and other conditions which may affect the performance of the steel deck.

3.2 INSTALLATION requirements applicable to both Roof and Floor deck

A. Install roof and floor deck panels and accessories according to applicable specifications and commentary of SDI 30, manufacturer’s recommendations, and requirements of this Section.

B. Cut and neatly fit roof and floor deck panels and accessories around openings and other work projecting through or adjacent to the decking.

C. Place roof and floor deck panels on supporting framing, and adjust the panels to their final position with ends accurately aligned and bearing on supporting framing before permanently fastening the panels to the framing.
1. Place roof and floor deck units in lengths that span 3 or more supports with overlapping side laps, unless otherwise indicated.

2. Place roof and floor deck panels flat and square, and fasten them to the supporting framing without warp or deflection.
3. Provide miscellaneous steel, as required, at columns and at beam/column moment connections to adequately support the weight of concrete and construction loadings.
4. Do not leave roof and floor deck unattached at the end of day's work.

D. Comply with AWS D1.1/D1.1M and ANSI/AWS D1.3 requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods for correcting welding work.

3.3 Additional requirements applicable to roof Deck INSTALLATION

A. Weld the edge ribs of roof deck panels to each steel supporting member by fusion welds as indicated on the Contract Drawings, or by elongated welds of equal strength.
1. Weld panels at each support, with a minimum of two welds per panel at each support.
2. Weld Diameter: 3/4-inch, nominal.
3. Weld Spacing: Space welds an average of 12 inches apart, except in the 10-foot by 10-foot. area at building corners where 6-inch weld spacing is required.
4. Weld Washers: Install weld washers at each weld location recommended by the deck manufacturer.

B. Side Lap and Perimeter Edge Fastening:
1. Mechanically fasten the side laps and perimeter edges of panels located between supports using self-drilling, number 10 diameter or larger, carbon steel screws spaced no more than 24-inches apart.

C. End Bearing:
1. Install deck ends over the supporting framing with a minimum end bearing of 1-1/2 inches, and with end joints overlapped.

D. Roof Sump Pans and Sump Plates:
1. Install roof sump pans and sump plates over openings provided in the roof decking, and weld their flanges to top of the deck.
2. Space welds not more than 12 inches apart with at least one weld at each corner.

E. Miscellaneous Roof Deck Accessories:
1. Install ridge and valley plates, finish strips, cover plates, end closures, and reinforcing channels according to the deck manufacturer's recommendations.
2. Weld the miscellaneous roof deck accessories to the substrate to provide a complete deck installation.

F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of decking, and support of other work as follows:.
1. Reinforce decking around openings with a 6-inch to 12-inch dimension in any direction by placing a steel sheet over the opening on the top of the decking, and fusion welding the sheet to the top surface of the deck.

a. Provide sheet steel of the same quality as the deck units, and at least 12-inches wider and longer than the opening unless otherwise indicated.
b. Provide welds at each corner and along each side spaced not more than 12-inches on center.
c. For openings with a 12-inch or greater dimension in any direction, provide additional miscellaneous structural steel members on all sides of each opening.

2. If more than one penetration occurs in a deck panel, contact the Engineer for reinforcement requirements.
3. Do not cut unscheduled openings through the deck without the approval of the Engineer.

3.4 QUALITY ASSURANCE TESTING

A. Independent Quality Assurance Testing and Inspection Agency:
1. Direct the Independent Quality Assurance Testing and Inspection Agency to perform field inspections and quality control testing, and to prepare test reports.
a. Direct the Agency to both conduct the tests and interpret the results.
b. Direct the Agency to provide written reports on all tests and inspections immediately after work is performed, and to indicate in the reports whether the test specimens comply with specified requirements or deviate from them.
2. Provide access for the Quality Assurance Testing and Inspection Agency to places where work is being performed so that required inspection and testing can be accomplished.

B. After placing the decking but prior to placing topping materials, direct the Quality Assurance Testing and Inspection Agency to inspect the decking for tears, dents, or other damage that may prevent the deck from acting as a form or diaphragm.

C. Field Weld Inspections and Testing:
1. Field welds are subject to testing and inspection.
2. Prior to the start of each day's production welding of headed stud type shear connectors (studs) and also after welding equipment has been moved or changed, weld and test two test studs in the presence of the Independent Quality Assurance Testing and Inspection Agency.
a. Direct the Agency to test these studs by striking the studs with a hammer until they are bent to a 30-degree angle from vertical.
1) If either stud's weld fails in the weld zone during this testing, correct or adjust the welding operation and weld new studs to replace the failed stud(s).
2) Test the new studs the same way the original studs were tested.
b. Do not begin production welding until two consecutively welded studs are found satisfactory by the Independent Quality Assurance Testing and Inspection Agency.
c. Replace the studs which fail inspection by the Independent Quality Assurance Testing and Inspection Agency at no additional expense to the Owner.
3. Direct the Independent Quality Assurance Testing and Inspection Agency to inspect and test shear connector welds according to the requirements of AWS D1.1 for stud welding.
a. Have the Agency conduct the inspections and tests required, and verify that welders are properly certified.
1) Visually inspect all shear connector welds.

a) Perform bend tests when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.
b) Conduct tests on additional shear connectors when weld fracture occurs on shear connectors already tested, according to the requirements of AWS D1.1.

2) Inspect and test a minimum of 10 percent of field-welded shear connectors according to requirements of AWS D1.1 for stud welding.

b. Record the work required and performed to correct deficiencies.

D. Conformation Testing:
1. The Quality Assurance Testing and Inspection Agency will perform additional tests, at the Contractor's expense, as necessary to reconfirm any noncompliance of original work and to show compliance of corrected work.

3.5 REPAIR/ReStoration

A. Correct deficiencies in steel deck work and shear connector placement that inspections and test reports have indicated to be not in compliance with requirements.

B. Remove and replace work that does not comply with specified requirements.
1. Repair or replace damaged decking prior to placing topping materials on the decking.

C. Galvanizing Repairs:
1. Repair damaged galvanized coatings by preparing surfaces and using galvanized repair paint according to the requirements of ASTM A 780 and the manufacturer's instructions.

3.6 PROTECTION

A. Protect and maintain the steel decking to ensure that it is not damaged or deteriorated at the Pre-Final Completion date.

END OF SECTION

SECTION 05 31 10 - STEEL ROOF DECK

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work of this Section includes, but is not limited to:

1. Steel roof deck and accessories
2. Formed steel cant strips.
3. Framing for openings in steel deck up to and including 12 inches.
4. Bearing plates and angles associated with steel deck.

1.2 RELATED SECTIONS

A. Section 07 41 13 – METAL ROOF PANELS

1.3 REFERENCES

A. AISI - Specification for the Design of Cold-Formed Steel Structural Members.

B. ASTM A36 - Structural Steel.

C. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

D. AWS D1.1 - Structural Welding Code

E. SDI - Design Manual for Composite Decks, Form Decks, Roof Decks.

1.4 SUBMITTALS

A. Shop Drawings: Indicate decking plan, support locations, projections, openings and reinforcements, pertinent details, and accessories.

B. Product Data: Provide deck profile characteristics and dimensions, structural properties, finishes, and limitations.

1.5 QUALIFICATIONS

A. Installer: Company specializing in performing the work of this Section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site and store and handle in a manner to preclude deformation and marring of finishes.

B. Cut plastic wrap to encourage ventilation.

C. Store decking on dry wood sleepers; slope for positive drainage.

1.7 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on approved shop drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel with galvanized coating thickness of G90 conforming to ASTM A653 Structural Quality.

B. Bearing plates and angles: ASTM A36 steel.

C. Welding Materials: AWS D1.1

D. Touch-Up Primer: Zinc chromate type.

E. Replacement roof decking at platform pedestrian canopy

1. United Steel Deck or approved equal; 3" deep type 'NI', 16 ga. galvanized steel corrugated deck, shop primed and painted as per finish schedule.

F. Edge and eve cap flashing in same gauge material as roof structure on all sides of pedestrian canopies.

2.2 ACCESSORIES

A. Flute Closures: Closed cell foam rubber; profiled to fit tight to the decking.

2.3 FABRICATION

A. Metal Decking: Corrugated sheet steel, configured as follows:

Span Design:	Varies, single and multiple conditions
Minimum Metal Thickness (Exclude Finish)	See Drawings
Normal Height:	See Drawings

Formed Sheet Width:	As per manufacturer
Side Joints:	Lapped
Flute Sides:	Plain vertical face

B. Metal Closure Strips, Cover Plates, Cant Strips, and related accessories: gage profile and size per manufacturer's recommendation.

C. Fabricate roof sump pan of 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

D. Method of fastening:

1. Provide butyl sealant tape between all panel seam overlaps of pedestrian steel deck canopies.

2. Connect roof panel to steel channels at end points at every flute. Pre drill holes and attach with #12 galvanized screws, with #5 self drilling tip, rubber grommet and ZAC heads. Fastener shall have a shoulder to eliminate over or under tightening of rubber grommet.

3. Attach panels together with #12 x 3/4" self drilling, galvanized, rubber grommeted zac head fastener in a stitch pattern @ 18" o.c. this to allows the bottom panel to be drawn tight to top panel.

4. Connect electrical conduit and light fixtures to steel deck canopies with ZAC head, galvanized, dual rubber grommeted bolt. Pre drill thru roof panel slightly larger than screw threads.

PART 3 - EXECUTION

3.1 EXECUTION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means Contractor accepts existing conditions.

3.2 INSTALLATION

A. Erect steel decking in accordance with SDI Design Manual for Roof Decks and manufacturer's instructions.

B. Bear decking on steel supports with 3 inch minimum bearing. Align and level.

C. Fasten deck to steel support members at ends and intermediate supports with fusion welds or mechanical fasteners at every transverse flute.

D. Weld in accordance with AWS D1.1.

E. Screw male/female side laps at 18 inches on centers, maximum, with #12 galvanized, rubber grommet ZAC head fasteners.

F. Reinforce steel deck openings from 5 to 12 inches in size with 2 x 2 x 1/4 angles. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld or mechanically attach to deck at each flute.

G. Install 6 inch minimum wide sheet steel cover plates, of same thickness as decking, where deck changes direction. Fusion welds or mechanically attach 12 inches oc maximum.

H. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.

I. Position roof sump pans with flange bearing on top surface of deck. Fusion weld or screw at each deck flute.

J. Place metal cant strips in position and fusion weld.

K. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating with touch-up primer.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 General Requirements, apply to this Section.

1.2 SUMMARY

A. Section Includes but is not limited to:

1. Steel framing and supports for mechanical and electrical equipment and stainless steel elevator entry.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Miscellaneous steel trims
4. Loose bearing and leveling plates for applications where they are not specified in other Sections.
5. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge- type inserts indicated to be cast into concrete or built into unit masonry.
6. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
7. Products furnished, but not installed, under this Section:
8. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge- type inserts indicated to be cast into concrete or built into unit masonry.
9. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
10. Steel fixed ladder at elevator pit.
11. Stainless steel elevator entry.

1.3 RELATED SECTIONS

A. Section 05 10 00 - Structural Metal Framing

B. Section 05 52 00 - Metal Handrail and Guardrail Systems

1.4 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F ambient; 180 deg F, material surfaces.

B. Reference Standards:

1. American Institute of Steel Construction (AISC):

   a. Specifications for the Design of Cold-Formed Steel StructuralMembers.
2. American Welding Society (AWS):

   a. ANSI/AWS D1.1-Structural Welding Code.

3. American Society for Testing and Materials (ASTM):

   a. A36/A36M, Specification for Carbon Structural Steel

   b. A47, Specification for Ferritic Malleable Iron Castings

   c. A48, Specification for Gray Iron Castings
   d. A53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
   e. A123, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   f. A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel hardware
   g. A 167-99 (R2004): Stainless and Heat-Resisting Chromium- Nickel Steel Plate, Sheet and Strip
   h. A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
   i. A320/A320M, Specification for Alloy Steel Bolting Materials for Low-Temperature Service
   j. A325, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi minimum Tensile Strength
   k. A336/A336M, Specification for Steel Forgings, Alloy, for Pressure and High-Temperature Parts
   l. ASTM A-380 – Standard Practice for Cleaning, Descaling, anD Passivation of Stainless Steel Parts, Equipment, and Systems
   m. ASTM A480/480M - General Requirements for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip
   n. A489, Specification for Carbon Steel Lifting Eyes
   o. A500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes p. A563, Specification for Carbon and Alloy Steel Nuts
   p. A570/A570M, Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
   q. A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   r. ASTM A666 - Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar for Structural and Architectural Applications
   s. A786/A786M, Specification for Rolled Steel Floor Plates u. F436, Specification for Hardened Steel Washers
   t. F 593-02: Stainless Steel Bolts, Hex Cap Screws, and Studs
4. Federal Specifications (FS)

   a. FF-B-561, Bolts, (Screw), Lag

   b. FF-B-588D, Bolt, Toggle: And Expansion Sleeve, Screw
   c. FF-S-92B(1), Screw, Machine, Slotted, Cross Recessed or Hexagon Head.

d. FF-S-111D, Screw, Wood
e. FF-S-325, Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry)
f. FF-T-276B, Thimbles, Rope g. FF-T-791B, Turnbuckle
g. FF-W-84A, Washers, Lock (Spring)
h. FF-W-92B, Washer, Flat (Plain)
i. TT-P-641G, Primer Coating; Zinc Dust-Zinc Oxide (For Galvanized Surfaces)

5. American National Standards Institute (ANSI):
   a. ANSI B.18.22.1, Plain Washers.

b. ANSI/ASME B.18.5, Round Head Bolts (Inch Series).
c. ANSI/ASME B.18.5.2.2M, Bolts, Metric Round Head Square Neck.

6. National Association of Architectural Metal Manufacturers (NAAMM)

C. Codes and Standards: In addition to complying with applicable Building Codes and regulations, comply with ANSI A 14.3, ANSI A 12.1, ANSI A58.1, and OSHA as applicable to stairs, ladders, railings and protection of floor openings.

D. Qualifications for Welding Work: Welds shall be made only by welders, tackers and welding operators who have been previously qualified by tests as prescribed in the Structural Welding Code, ANSI/AWS D1.1 of the American Welding Society to perform the type of work required.

1.5 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

B. Copies of manufacturer's catalog cuts, specifications, load tables, dimension diagrams, anchor details, setting diagrams and templates, and manufacturer's printed installation instructions, including paint products.

C. Certificates of welders' qualifications showing date of qualification, qualification grade and rating, and notarized signature of inspector.

D. Samples of materials and finishes of products as specified and if requested by the Engineer.

E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Qualification Data: For qualified professional engineer.

G. Certification confirming that stainless steel is Type 316 and has been properly polished.

H. Field Testing Results confirming the use of Type 316 Stainless Steel.

I. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.

J. Welding certificates.

K. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer of metal fabrication is a certified installer with documented history installing manufacturer's products according to manufacturer's specifications.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

3. AWS D1.6, "Structural Welding Code - Stainless Steel."

D. Verify dimensions at worksite before preparation of shop drawings and before product fabrication begins. Surfaces to receive metal fabrication shall be sound, square, and true; examine surfaces for defects that would impair installation of metal fabrications before metal fabrications are installed.

E. Stainless steel fabrications shall be from a manufacturer who has a dedicated facility for the assembly, welding, and polishing of stainless steel. The manufacturer should have dedicated tooling, fixtures, and machine tools, for the manufacturer of stainless steel products. Dedicated is defined as exclusively used for the use on stainless steel materials. This is to avoid contamination with other metals, especially carbon steel.

F. Provide certification by the passivator stating that the fabrication was passivated after the stainless steel was bent, cut and/or welded.

1. If evidence of contamination is observed at the job site, Contractor shall clean and repassivate all damaged stainless steel. Contractor shall submit their proposed process for cleaning and repassivating and shall submit a mock-up to Metro-North for approval prior to start of work.

G. Field Testing for stainless steel:

1. All stainless steel must be Type 316.

2. To confirm the use of Type 316 Stainless Steel throughout, the Contractor is required to perform field testing in the presence of a Metro-North inspector as stainless steel components are delivered in the field.

3. Testing shall be performed using the Molybdenum Electro Spot Test. Method shall be submitted and approved by Metro-North.

4. Testing shall be in addition to, not in lieu of, the supplier providing the certifications required by this specification.

5. Testing shall also confirm that Type 316 Stainless Steel has been properly passivated and polished.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendationsto ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages and steel weld plates and angles.

C. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.9 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Schedule delivery of materials at the site at such time as required for proper coordination of the work. Receive materials in manufacture’s unopened packages and bearing manufacturer’s label

B. Storage and handling:

1. Store materials in a dry and well ventilated place, adequately protected from damage and exposure to the elements.

PART 2 - PRODUCTS

2.1 Steel Ladders:

A. Manufacturers: Subject to compliance with requirements, provide products of the following:

1. Worthington Metal Fabricators
2. Lapeyre Stair Inc.
3. ACL Industries, Inc.
4. ALACO Ladder Company
5. Or approved equal.

B. Ladder

1. Space side rails 16 inches apart unless otherwise indicated.
2. Side rails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
3. Rungs: 3/4-inch diameter steel bars.
4. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
7. Galvanize ladders, including brackets.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or

C. ASTM A 666, Type 304.316/316L.

D. Stainless Steel Sheet, Plate, Flat Bar: ASTM A666, Type 316/316L

E. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304 316/316L

F. Steel Tubing: ASTM A 500, cold-formed steel tubing

G. Steel Pipe: ASTM A 53/A 53M, standard weight unless otherwise indicated.

H. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: minimum 1-5/8 by 1-5/8 inches.

2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B or structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.

2.4 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B 209 Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B 221 Alloy 6063-T6.

C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6. D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

D. Bronze Plate, Sheet, Strip, and Bars: ASTM B 36/B 36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper).

E. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).

F. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).

G. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.

H. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.5 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.

2. Provide stainless-steel fasteners for fastening stainless steel.

3. Provide stainless-steel fasteners for fastening nickel silver.

4. Provide bronze fasteners for fastening bronze.

B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

D. Eyebolts: ASTM A 489.

E. Machine Screws: ASME B18.6.3

F. Lag Screws: ASME B18.2.1.

G. Wood Screws: Flat head, ASME B18.6.1. H. Plain Washers: Round, ASME B18.22.1.

H. Lock Washers: Helical, spring type, ASME B18.21.1.

I. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

J. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

K. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Division 09 Section 09 91 10 Painting.

C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

G. Concrete: Comply with requirements in Division 03 Section 03 30 00 Cast-in-Place Concrete for normal-weight, air-entrained, concrete.

2.7 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

J. Stainless steel shall not be welded to non-stainless steel.

K. All stainless steel shall be passivated prior to packaging and shipping. Any area that has been cut, welded or bent shall be passivated to assure that the area does not show signs of rust discoloration created by the fabrication processes.

L. Stainless Steel

1. Stainless Steel grain shall run in same direction for each fabrication.

2. Finish shall be #4 brushed for all components, unless otherwise specified on the drawings, with surface roughness of 15 micro- inches maximum

3. When polishing is completed, passivate and rinse surfaces. Remove any embedded foreign matter and leave surfaces chemically clean.

2.8 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.

2. Furnish inserts for units installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.

E. Prime miscellaneous framing and supports with primer specified in Division 09 Section 09 91 00 Painting where indicated.

2.9 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize miscellaneous steel trim.

D. Prime miscellaneous steel trim with primer specified in Division 09 Section 09 91 00 Painting.

2.10 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

C. Prime plates with zinc-rich primer.

2.11 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.12 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.13 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with primers specified in Division 09 Section 09 91 00 Painting unless otherwise indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Division 09 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

E. Stainless Steel

1. Stainless Steel shall be Austenitic Grade AISI type 316/316L

2. Stainless Steel Type 304 will not be considered acceptable.

3. Welding materials: AWS Structural Welding Code: type required for materials being welded. Use E316 low hydrogen electrodes for stainless steel welds.
4. Stainless Steel shall not be painted unless otherwise noted.

2.14 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which miscellaneous metal items are to be installed. Surfaces that are to receive metal fabrications shall be free from defects. Embedded products shall have been installed where indicated.

B. Furnish setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.

2. Extruded Aluminum: Two coats of clear lacquer.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates.
1. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

2. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.4 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 Section 09 91 00 Painting.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

D. Clean after installation exposed pre-finished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the metal manufacture and protected from damage until completion of the project.

E. Stainless Steel: Clean after installation exposed pre-finished and plated items and items fabricated from stainless steel, as recommended by the metal manufacture and protect from damage until completion of the project.

1. If any surface staining becomes apparent, stainless steel must be cleaned and repassivated by experienced personnel. If this action is deemed necessary by Metro-North or Architect/Engineer, Contractor shall submit their proposed process and a mock-up to Metro-North for approval prior to start of work.

2. Only approved stainless steel cleaners shall be used. Strong unapproved acids such as muriatic or cleaners containing chlorine shall not be used.

END OF SECTION

SECTION 05 50 10 - MISCELLANEOUS METALS

PART 1 - GENERAL REQUIREMENTS

1.1 Scope of Work

A. Furnish and install all materials, tools and equipment necessary for miscellaneous metals work as indicated on the Construction Drawings and as specified herein.

1.2 Codes and Standards

A. At a minimum, all materials and work furnished pursuant to this Specification shall comply with the latest edition of the following applicable code provisions and all applicable standards listed below. The publications listed below are incorporated herein by reference to the extent applicable.

B. ANSI - American National Standards Institute / NFSI - National Floor Safety Institute

1.	ANSI/NFSI B101.3-2012	Test Method of Measuring Wet DCOF of Common Hard - Surface Floor Materials

C. ADAAG - ADA Accessibility Guidelines for Buildings and Facilities

D. ASTM - American International

1.	ASTM A27/A27M-13	Standard Specification for Steel Castings, Carbon, for General Applications
2.	ASTM A36/A36M-14	Standard Specification for Carbon Structural Steel
3.	ASTM A48/A48M-03(2012)	Standard Specification for Gray Iron Castings
4.	ASTM A53/A53M-12	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless
5.	ASTM A240/A240M-15a	Standard Specification for Chromium and Chromium-Nickel Stainless Steel, Plate, Sheet, and Strip for Pressure Vessels and General Applications
6.	ASTM A480/480M-14b	Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
7.	ASTM A536-84(2014)	Standard Specification for Ductile Iron Castings
8.	ASTM A1008/A1008M-15	Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened & Bake Hardenable
9.	ASTM A1011/A1011M-14	Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Ultra High Strength

E. NFSI - National Floor Safety Institute

1.3 Quality Assurance

A. All work as much as practicable, shall be built up and assembled in the shop and shall conform to the actual measurements taken by the Contractor at the site where the work is to be installed. All work shall be plumb and true and in conformity with the Construction Drawings.

B. For all fabricated items: The Fabricator shall have a minimum of three (3) years of experience in the fabrication of items of the types specified.

C. All walkway surfaces including stairs shall meet the requirements of the referenced standards for wet dynamic coefficient of friction (DCOF) cited herein and shall be specified as high traction products.

D. Walkway surface products shall have the manufacturer's certificate of compliance issued by the National Floor Safety Institute (NFSI).

E. Contractor shall be responsible for all errors that can be discovered by checking or examining the shop drawings. The approval of such shop drawings by the Design Professional and the Engineer shall not relieve the Contractor of this responsibility.

1.4 Submittals

A. Submit product specifications, installation instructions, certificates of compliance and other data necessary to prove compliance with the requirements specified herein and with the referenced standards.

B. Drawings: Submit shop drawings, including plans, elevations, sections and details of castings, gratings and other metal fabrications and their connections that are required in this Section.

C. Design Calculations: For all metal fabrications that are required to comply with design loadings, submit calculations signed and sealed by a Professional Engineer licensed to practice in New York State.

D. Submit manufacturer's product Certificate of Compliance issued by the NFSI for each walkway surface product specified including but not limited to stairs, access hatches and covers of equipment.

1.5 Manufacturer's Warranty

A. Provide manufacturer's written warranty for repair or replacement of materials that are defective or shows substandard workmanship or fails within a one (1) year warranty period.

1.6 Delivery, Storage, and Handling

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

B. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

C. Stack materials out of mud and dirt and provide for proper drainage. Protect from damage or soiling by adjacent construction operations.

D. The Engineer reserves the right to reject any material which has been stored improperly.

PART 2 - MATERIALS

2.1 Steel

A. Steel for miscellaneous metals shall conform to ASTMA529. Steel for steel gratings shall conform to ASTM A1011, Grade D.

2.2 Steel Pipe

A. Galvanized steel pipe shall conform to ASTM A53 for seamless pipe.

2.3 Cast Iron Process

A. Cast iron shall be of gray iron casting, and shall conform to Class 30 ASTM A48.

B. Annealed ductile iron shall conform to ASTM A536, cast grade 65-45-12, with a minimum tensile strength of 65,000 psi.

2.4 Cast Steel

A. Cast steel shall conform to the requirements of ASTM A27, with the following requirements:
1. Ultimate tensile strength, pounds per square inch, minimum.....65,000
2. Yield point, pounds per square inch, minimum.....35,000

2.5 Fasteners

A. Use Type 316L stainless steel anchor bolts or expansion bolts securing miscellaneous metals to masonry, as directed by the Design Professional. Use anchor bolts to secure railings to copings, floors, and stairs. Use expansion bolts where it is necessary. Drills holes to the exact size in the masonry for the bolts or sleeves. Do not use packing. Install expansion bolts of the approved type, diameter, and length. Set anchor bolts into epoxy. Fill holes thoroughly and caulk. Provide tamper resistant type fasteners.

2.6 Aluminum

A. Aluminum shall be made from the best grades of virgin metal and scrap of known and approved composition. The aluminum shall be of the proper alloy. It shall receive an anodizing surface treatment suitable for the intended purpose for which the material shall be used. The treatment shall be accordance with the specifications and recommendations of the Aluminum Company of America. Aluminum shall also receive a protective coating of an approved lacquer.

B. Aluminum sheet shall be true to gauge, uniform in quality and temper, shall be sound, smooth, and clean, free from seams, laminations, buckles or other defects, and shall be commercially flat to a degree suitable for the intended purpose.

C. All bolts, nuts, washers, screws and rivets shall be of stainless steel unless otherwise specified herein.

D. Special precaution shall be taken to prevent galvanic action between the metals when aluminum comes in physical contact with other metals.

E. Provide a bituminous coating or other type of galvanic separator when aluminum comes into contact with wet cementitious products.

F. Reinforce aluminum for the attachment of hardware. Use stainless steel screws for securing steel or bronze hardware. Steel hinges and bronze hardware in direct contact with aluminum work shall be heavily chromium plated and given a satin finish.

G. The exposed surfaces of aluminum unless otherwise specified herein, shall have a directional "satin finish". "Satin finish" shall mean the surfaces of aluminum are finished with very fine scratched lines obtained by the use of various grades of abrasive, the abrasive being used in steps from coarse to fine sizes. The satin finish will be determined through sample approval process.

2.7 Stainless Steel

A. Provide Type 316L for stainless steel exposed to the exterior environment, with a satin No. 4 finish as specified by ANSI standards for architectural stainless steel and as per U.S. standards, or as otherwise indicated on the Construction Drawings.

B. Protect all stainless steel products from contamination during forming or other manufacturing steps such as forging, machining, heading, conning, drawing, welding, or spinning.

C. Work done in shops shall not be performed on machines or with tools that have been used on carbon steel.

D. Thoroughly clean grinding tools before use on stainless steels.

E. After fabrication chemically clean the stainless steel in solutions (recommended by the American Steel Institute) that will dissolve carbon steel particles.

2.8 Stainless Steel Handrail Pipe and Bracket

A. Use Type Schedule 40 ASTM 240 stainless steel tubing with a satin No. 4 finish. Provide a minimum 1.66” outside diameter for pipe and fittings.

B. Use Type 316L Stainless steel for handrails and guardrails exposed to the exterior environment.

C. Space stainless steel handrail brackets no more than four feet on center. Provide brackets as manufactured by Julius Blum & Co., Inc., or R & B Wagner Inc., or approved equal as indicated on Construction Drawings.

D. Provide continuous diameter handrails throughout the length of pipe. Welding and grinding smooth procedures of connections at curves or straight runs shall not diminish the diameter of the handrail pipe. Handrails and appurtenances shall be smooth throughout.

2.9 Cast Aluminum Abrasive Treads/Nosings

A. Stair nosings and treads: Abrasive cast aluminum, cross hatched pattern with integral safety edge strip and 1" x 1-1/2" nose, Alloy 443, or equivalent in quality and performance to one of the following manufacturers, or approved equal:
   1. Safe-T-Metal Co. Inc.: Abrasive material is No. 24 electric-furnace corundum grit
      a. Model KK-ADA can be specified with or without toeplate. With toeplate for steel stairs and without when embedded in concrete.
   2. Wooster Products, Inc.: Wooster's Alumogriit (abrasive cast aluminum) - No. 43 prime ingot, low copper content corrosion resistant.
      a. Model 105: Treads with toeplate attach to steel stairs.
      b. Model 105A: Treads without toeplate, embed into concrete.
   3. American Safety Tread Co. Inc.: American Safety Tread's Alumnacast (abrasive cast aluminum)
      a. Model 805 - ADA can be specified with or without toeplate. With toeplate for steel stairs and without when embedded in concrete.
      b. Where existing concrete stairs have recessed risers and concrete nosings, the stair treads shall be abrasive cast aluminum, cross-hatched pattern with 5/16” x 1-1/2" nosing, Alloy 443, or equivalent in quality and performance. Stair treads shall be model type 116A, manufactured by Wooster Products, Inc., or approved equal.
      c. Where stair tread and nosings are exposed to inclement weather, water, salt and highly corrosive elements use Aluminum Alloy 535.2.

B. Any holes or countersinks shall be machine-made. Cored holes or countersinks are not acceptable. Screw heads shall not protrude above tread surface. Furnish treads with two rows of pre-drilled countersunk holes. Hole spacing shall be 12” on center, staggered, and 3” maximum from each end. Nuts, and bolts for attaching the treads shall include a lock washer.

C. All metal types shall have a shot-blasted finish with treads and nosings.

D. Tread Thickness: 5/8" thick minimum abrasive cast aluminum treads.

E. Tread Tolerances: Treads up to 3 feet in length shall be level with a tolerance of 1/16th of an inch. Treads between 3 feet to 6 feet in length shall be level with a tolerance between the range of 1/16th to 1/8 of an inch. Treads longer than 6 feet shall be level with a tolerance of 1/8 of an inch maximum. There shall be no warpage from the back of the tread to the nosing.

F. Provide a galvanic separator (self-adhering EPDM) between aluminum tread and steel support.

G. Provide factory applied zinc chromate coating to all surfaces where contact shall occur with treads installed in concrete, or on a mortar bed, or other cementitious material. Do not use spacers to level the bed.

H. Embed fasteners a minimum of 2-1/2” into the concrete for tread installation on concrete stairs.

2.10 Sheet Metal

A. Sheet Steel: Cold-rolled, rust-resisting commercial sheet steel, conforming to ASTM A1008. Minimum 16 gauge unless otherwise indicated.

B. Sheet Stainless Steel: ASTM A480, rollable temper stainless steel, brush finish unless otherwise noted.

PART 3 - EXECUTION

3.1 Steel Gratings

A. Steel gratings shall be of the type indicated on Construction Drawings.

B. Gratings shall be set in frames as indicated on the Construction Drawings. Place all bearing bars in the short dimension of the span.

C. Gratings and frames shall be galvanized after fabrication by the "hot dip" process, as specified in Section 9M - Galvanizing. Coat all surfaces with at least two ounces of zinc per square foot of galvanized surface. Preliminary hot dip gratings before fabrication, in addition to the final dip stated above, if the Design Professional deems it necessary.

3.2 Pipe Railings

A. Weld pipe railings and guard rails to base plates or angles and secure to concrete with expansion bolts. Accurately cut pipe for a close-fit at all intersections. Weld all joints. Ground welds smooth without impairing their strength. Paint railing as specified in Section 9A/9AS - Painting.

3.3 Miscellaneous Architectural Steel and Iron

A. Provide miscellaneous architectural steel and iron work where indicated on the Construction Drawings, or as required by the Design Professional for:
1. Steel ladders, stairways (including pipe railings), and landings.
2. Steel supports.
3. Checkered steel plate covers with continuous steel angle frames for pipe trenches and pits.
4. Cable pulling eyes, pipe barriers with chains, swing bars, lintels, and handgrips.
5. Cable racks for manholes.
6. Services boxes.
7. Steel manhole steps.

B. Provide ladders with rungs that consist of flat steel stringers with round or flat steel rungs. Rungs shall be peened, and welded on the outside of the stringers. Secured ladders with expansion bolts set in masonry. Install toe holds in the masonry as indicated on the Construction Drawings.
1. Paint steel ladders at the ends of platforms leading to the track area safety yellow as specified in Section 9A/9AS - Station Painting.

C. Install steel ladders and stairways (including the ladders for sidewalk hatches) consisting of flat steel stringers or channels, with angles welded or riveted thereon for the support of the treads. Provide

treads made of checkered steel plates with checkered plate nosings that are bolted to the supporting angles, as shown on the Contract Drawings. Secure stringers for ladders and stairways with clip angles, and expansion bolts set into the masonry. Provide checkered, steel plate, landings for ladders and stairways supported on steel shapes, as shown on the Contract Drawings.

D. Provide grip bars or railings of steel in conjunction with all stairways, ladders and landings.

E. Furnish and install miscellaneous steel shapes necessary to complete the work under this Contract.

F. Work shall be as far as practicable built-up and assembled in the shop. Conform to actual measurements taken at the work site.

G. Protect primed or galvanized surfaces against damage during construction and remove protection at time of substantial completion.

H. Install work plumb, level and in line with adjacent structure.

3.4 Metal Door Saddles

A. Metal door saddles shall be of approved cross-section, scribed and fitted to the door jambs and shall be of the type indicated on Construction Drawings, or approved equal. Wood blocks and metal anchors or expansion bolts shall be set in place in the concrete floors for securing saddles in place.

3.5 Stanchions (Guard Posts or Bollards)

A. Install seamless, extra strong, concrete filled, ASTM A500 galvanized steel pipe, Grade 'B" (extra heavy) stanchions where shown on the Construction Drawings. Fill space between pipe, and sleeve with grout, or an appropriate material approved by the Design Professional. Contractor shall perform all masonry work.

3.6 Abrasive Stair Treads and Nosings

A. Do not install stair treads that show any signs of warp or bowing. Check treads for compliance with tolerances.

B. Coordinate installation where tile pavers are disturbed. Chop existing treads, install anchors as required, in mortar bed.

C. Construct new concrete steps to the proper level and pitch. Cure concrete steps prior to tread installation.

D. Install treads using manufacturer's recommended counter sunk bolt.

E. Install treads in accordance with the recommended procedure listed below:
   1. Spread thin set mortar evenly spread on top of the concrete step.
   2. Back-buttered treads with a thin layer of thin set mortar to ensure full bond between tread and substrate.
   3. Set treads shall be into freshly laid mortar. Remove and re-install mortar that has already set.
   4. Adjust treads for proper pitch (front to back), and leveled from left to right.

5. Drill holes for anchors through freshly laid mortar, and into the concrete step to accept an expansion bolts.
6. Install and only partially tighten expansion bolts to set the tread down into the mortar, and adjust to keep the tread properly pitched and level.
7. Tighten expansion bolts all the way after mortar is cured.

F. Rest stair treads and nosings continuously, and solidly on cement substrate. There shall be no voids. Center stair treads, and nosings within stair sidewalls. Pitch treads forward for positive drainage in accordance with the Building Code of New York State. Back pitching is not acceptable.

3.7 Sheet Metal Fabrication

A. Fabricate sheet metal items using concealed lock joints and continuous welds. Close tops and bottoms with inverted steel channels. Ensure that all items exposed to the weather are watertight.

B. Provide steel plate, angle, or channel reinforcing as indicated or as required to ensure rigid, even assembly.

Submittal Approvals

Item No.	Paragraph No.	Submittals	Approval By (Engineer or Designer)
1.	1.5 a	Product specifications, installation instructions, certificates of compliance and other data.	Design Professional and the Engineer
2.	1.5 b	Shop Drawings	Design Professional
3.	1.5 c	Design calculations	Design Professional
4.	1.5 d	Submit manufacturers product certificate of compliance	Contractor’s Quality Manager
5.	1.6 a	Manufacturer's warranty	Engineer

Notes:

1. This table does not include approvals for “or-equal” proposals.

END OF SECTION

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SECTION 05 52 00 - METAL HANDRAIL AND GUARDRAIL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 General Requirements, apply to this Section.

1.2 SUMMARY

A. The work specified in this Section consists of furnishing and installing metal handrails, guardrails and railings as shown and as indicated on the Contract Drawings, including, but not limited to:
   1. Powder coated galvanized Steel Guardrails
   2. Stainless steel Handrails

1.3 RELATED SECTIONS

A. Section 05 50 00 – Metal Fabrication

1.4 PERFORMANCE REQUIREMENTS

A. American Society for Testing and Materials (ASTM):
   1. A36, Specification for Carbon Structural Steel.
   2. A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
   3. A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   4. A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
   5. A320, Specification for Alloy Steel Bolting Materials for Low-Temperature Service.
   6. A449, Specification for Quenched and Tempered Steel Bolts and Studs.
   7. A563, Specification for Carbon and Alloy Steel Nuts.
   8. E935, Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.

B. American Welding Society (AWS):
   1. ANSI/AWS D1.1 - Structural Welding Code.

C. Steel Structures Painting Council (SSPC):
   1. Steel Structures Painting Manual, Volume 2, "Systems and Specifications".

1.5 SUBMITTALS

A. In accordance with Chapter 14, Article 1, of the Contract Terms and Conditions, submit the following:
   1. Shop Drawings: Show plans and sections; materials of construction; finishes; methods of fastening; locations of cuts, copes, connections, holes, and threaded fasteners; methods of joining components; type, size, and spacing of welds; and proposed marking of fabrications which will require field assembly.
   2. The contractor has an absolute obligation to meet all applicable codes controlling the fabrication and installation of handrails and guardrails. Shop drawings which either omit information or show information which is in violation of applicable codes will not, even if approved, allow the contractor to install components which will not meet code. Any railing which does not conform to the applicable codes will be removed and replaced at no cost to owner.
   3. Copies of manufacturer's catalog cuts and specifications.
   4. Certificates of welders' qualifications showing date of qualification, qualification grade and rating, and notarized signature of inspector.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer of metal handrail and guardrail systems is a certified installer with documented history installing manufacturer’s products according to manufacturer’s specifications.

B. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:
   1. Stainless Steel: ASCE 8, "Specification for the Design of Cold-Formed Stainless Steel Structural Members."
   2. Structural Steel: AISC S335, "Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design with Commentary."

C. Structural Performance of Handrails and Railings: Provide handrails and railings complying with requirements of ASTM E 985 for structural performance, based on testing performed according to ASTM E 894 and ASTM E 935.

D. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding structural loads required by ASCE 7 without exceeding allowable design working stresses of materials for handrails, railings, anchors, and connections.

E. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stresses of materials for handrails, railings, anchors, and connections:
   1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:
      a. Concentrated load of 200 lbf applied at any point and in any direction.
      b. Uniform load of 50 lbf/ft. applied horizontally and concurrently with uniform load of 100 lbf/ft. applied vertically downward.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.

2. Handrails Not Serving As Top Rails: Capable of withstanding the following loads applied as indicated:
   a. Concentrated load of 250 lbf applied at any point and in any direction.
   b. Uniform load of 50 lbf/ft. applied in any direction.
   c. Concentrated and uniform loads above need not be assumed to act concurrently.
3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 250 lb applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.
   a. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guard.

F. Thermal Movements: Provide handrails and railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

G. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.7 DELIVERY, STORAGE AND HANDLING

A. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating handrails and railing systems without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

PART 2 - PRODUCTS

2.1 GUARDRAILS

A. All Steel should be hot dipped galvanized (as per ASTM A525-G90) with a polyester resin based powder coated finish (black) applied electrostatically and baked on.

2.2 HANDRAILS

A. Railings shall be constructed of:

1. 1 and 1/2 inch max. diameter 316 stainless steel
2. Finish: No. 5

B. Handrail brackets: Julius Blum Co. Inc - (800) 526-6293 – Stainless Steel handrail bracket #478, or approved equal.

2.3 MATERIALS

A. Steel Pipe for Railings and Pipe Supports: Seamless steel pipe, conforming to ASTM A53, Type S, Grade A; 1-1/2 inch diameter; standard weight. Provide special instructions to the pipe manufacturer to provide Architectural Handrail Grade Pipe.

B. Plate: Steel plate for anchor plates shall be standard steel plate, conforming to ASTM A36, weldable quality.

C. Welding Electrodes and Filler Metal: The Contractor shall use the type and alloy of filler metal and electrodes recommended by the producer of the metal to be welded, and as required to match colors, and strength and for compatibility with the individual components of fabricated items.

D. Anchors, Fasteners, and Accessories: Provide all required anchors, fasteners, miscellaneous components, and accessories as required for complete and finished railing installations. Bolts and studs, nuts, and washers shall conform to ASTM A307, A449, and A563.
   1. Expansion Bolts: Where anchors are not included in the concrete construction, provide galvanized expansion type anchors with matching galvanized steel bolts or studs with nuts, of sizes as indicated or required. Provide washers under all bolt heads and nuts.
   2. Miscellaneous fasteners: Refer to Section 05 50 00 “Metal Fabrication”.

E. Paint: Specified in Sections 09 91 10

F. Fasteners for Anchoring Railings to Other Construction: Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railing to other types of construction indicated and capable of withstanding design loadings.
   1. Provide fasteners fabricated from type 304

G. Fasteners for Interconnecting Railing Components: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
   1. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, except where otherwise indicated.
   2. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, except where exposed fasteners are unavoidable or are the standard fastening method for handrail and railing system indicated. Provide Phillips flathead machine screws for exposed fasteners, unless otherwise indicated.
   3. Provide non-metallic isolators between aluminum and all ferrous metals.

H. Powder-Coat finish: Prepare, treat, and coat galvanized metal to comply with resin manufacturer’s written instructions and as follows:

1. Prepare galvanized metal by thoroughly removing grease, dirt, oil, flux, and other foreign matter.
2. Treat prepared metal with zinc-phosphate pretreatment, rinse, and seal surfaces.
3. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils (0.04 mm)
4. Apply thermosetting polyester. Gloss 60+/-5 units. Bake 10 minutes at 400 degrees Fahrenheit.
5. Color: Vulcan Black SD, P6SB56

2.4 FABRICATION

A. Fabricate pipe railings to dimensions and details indicated with smooth bends and to other requirements specified herein.

B. Welded Connections: Fully weld connections, heat and bend bends without distorting metal. Cope intersections of rails and posts, weld joints and grind smooth. Butt-weld end-to-end joints of railings. In all cases, fabricate top rail continuous over posts, and posts continuous from base to top rail. Welding procedures and welding operations shall conform to, and welders and tackers shall be qualified, in accordance with ANSI/AWS D1.1.

C. Form exposed work to line and level with angles and surface and with straight sharp edges. Ease exposed edges to radius of approximately 1/32 inch unless otherwise shown. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.

D. Form exposed connections with hairline joints to exclude water and which are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type shown, or if not shown, Phillips flathead (countersunk) screws or bolts.

E. Assemble railing systems in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

F. Form changes in direction of railing members as follows:
   1. By radius bends of radius indicated.
   2. By flush radius bends.
   3. By bending.
   4. By mitering at elbow bends.
   5. By insertion of prefabricated flush elbow fittings.
   6. By any method indicated above, applicable to change of direction involved.

G. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

2.5 CLEANING AND PAINTING

A. General:
   1. Exterior guardrails, where indicated to be painted on the drawings, non-galvanized and galvanized, shall be painted in accordance with Division 09 Section 09 91 00 Painting

B. Corrosion Control: Apply corrosion inhibitor to railing surface that will abut surfaces constituted of material other than that of the fabricated metal product.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Install metal handrails and guardrails in accordance with the Contract Drawings and the approved shop drawings.

B. Install metal handrails and guardrails with accessories furnished by the railing fabricator as required for complete and finished railing installations.

C. Install handrails and guardrails in accordance with approved shop drawings, true and horizontal, perpendicular, or at the required angle, as the case may be, level and square, with angles and edges parallel with related lines of the building or structure.

D. Adjust railing prior to securing in place to ensure proper matching of butting joints and correct alignment throughout their length. Secure posts not more than 8 feet on center, unless otherwise indicated. Plumb posts in each direction.

E. Secure posts and rail ends as follows:
   1. Installation in new concrete:
      a. Set posts in sleeves which have been set in concrete, and grout posts therein with non-shrink grout.
   2. Anchor rail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into the wall construction with expansion bolts.
   3. Anchor rail ends to steel with steel oval or round flanges welded to rail ends and bolted to the structural steel members, unless otherwise indicated.
   4. Provide removable railing sections as indicated. Furnish slip-fit metal socket or sleeve for casting into concrete. Accurately locate sleeve to match post spacing.

F. Other than field welded connections:
   1. Assemble connections end-to-end and splice joints with internal sleeves.
   2. Fitting assembly:
      a. Assemble pipe at joints and drive together within 0.02 inch.
      b. Assemble fittings into posts before pressing rails into fittings.

3.2 PREPARATION

A. Comply with AWS code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

B. All welds shall be subjected to a visual inspection by an independent inspection agency, provided by and paid by the Contractor, for conformance with ANSI/AWS D1.1.

3.3 INSTALLATION, GENERAL

A. After installation, exposed painted surfaces, field welds, and other abraded or damaged primed surfaces shall be prepared as required and touched up with an additional coat of the same primers for ferrous and galvanized surfaces as previously specified for shop painting.

B. Lightly sand and feather out such damaged surfaces so that paint touch-up becomes invisible. Spray-paint all touch-up work.

C. Finish field painting is specified in Division 09 Section 09 91 00 Painting.

END OF SECTION

SECTION 05 99 20 - JACKING OPERATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies requirements for the design, furnishing, assembly, erection, use, and removal of temporary jacking systems for the purposes of raising the overpass structure at Scarsdale Station seven inches (7”) to enhance vertical clearance underneath. This work also includes any required modifications to the existing superstructure at proposed jacking points such as, but not limited to the installation of supplementary jacking stiffeners, and semi-permanent additional stair risers resulting from the lift.

1.2 REFERENCES

A. The following is a listing of the publications referenced in this Section:
   1. American Association of State Highway and Transportation Officials (AASHTO)
   2. Standard Specifications for Highway Overpass
   3. Guide Design Specifications for Overpass Temporary Works
   4. American Institute of Steel Construction (AISC)
   5. Code of Standard Practice for Steel Buildings and Overpass:
      a. Sections 2, 3, 5 and 6 only (except that all references to the responsibility of the Owner and the Engineer will not apply).
   6. Specification for Structural Joints Using High Strength Bolts
   7. American Welding Society (AWS)
      a. Structural Welding Code, Steel
   8. AASHTO Overpass Welding Code

1.3 QUALITY ASSURANCE

A. The entity performing the Work of this Section shall have a minimum of three years of experience in performing jacking operations involving complexities similar to those required under this Contract and shall employ labor and supervisory personnel experienced in this type of Work, and have successfully completed a minimum of three (3) contracts in the last 5 years from the day of submission of the proposal for this contract.

1.4 SUBMITTALS

A. See Section 01 33 00 Submittal Procedures

PART 2 - PRODUCTS

2.1 MATERALS

A. Temporary jacking systems, including beams, brackets, plates, shapes, shims, welds, bolts, rods, supplementary stiffeners and all other required appurtenant hardware and materials shall be fabricated in accordance with Specification Section 05 50 10.

B. Hydraulic jacks shall be Enerpac Heavy Duty Hydraulic Cylinders, with a minimum lifting capacity of two times the required lifting force (with locking collars unless otherwise shown on the Contract Drawings) as manufactured by Enerpac, Menomonee Falls, Wisconsin or approved equal. The rated capacity shall be shown clearly on the jack.

C. Structural steel and timber to be used for the temporary supports may have been previously used, provided they are in good condition and satisfactory to the Engineer. All high strength bolts, anchor bolts, threaded rods, nuts and washers shall be new.

D. Material shall meet the following ASTM Specifications:

1.	Timber	ASTM D245
2.	High Strength Bolts, Nuts and Washers	ASTM A325, A563, & F436
3.	Anchor Bolts	ASTM F568 Class 8.8 or A449 or A576
4.	Anchor Bolts Nuts and Washers	ASTM A325
5.	Threaded Rods, Nuts and Washers	ASTM A307

PART 3 - EXECUTION

3.1 JACKING OPERATIONS

A. The Contractor shall prepare and submit Shop Drawings for all temporary jacking systems. These Shop Drawings shall include all pertinent details and complete design calculations including verification of the ability of the existing superstructure to be supported at the proposed jacking points. Supplementary stiffeners will be required to maintain the stability of the superstructure during jacking. These stiffeners shall be designed as permanent appurtenances. As such, they shall be primed and painted to the same color as the adjoining steel substrate. Supplementary stiffeners may only be attached to the overpass girders via bolted connection. Preparation of the existing steelwork surfaces where supplementary stiffeners are required shall be in accordance with Specification Section 05 12 00. All supplementary stiffeners shall remain after bearing replacement work is complete. Temporary jacking support systems and supplementary stiffeners shall be designed, signed and sealed by a Professional Engineer licensed in the State of New York and must be approved for use by the Engineer. No jacking shall proceed until all relevant shop drawings and calculations have been approved by the Engineer.

B. All temporary jacking systems, as well as the jacks themselves, shall be designed to support a Design Jacking Load of no less than the following load combination:

1. Design Jacking Load = 2.0(DL + LL +Impact +Anticipated Construction Loads)

C. The temporary jacking system shall be designed to support the Design Jacking Load at all support locations prior to reaching the yield point of the supporting steelwork or the allowable compressive stress of supporting foundation system. The Design Jacking Load shall not exceed the safe working limit of the jack. All horizontal loads and rotations or translations as provided on the Plans shall be considered in the design of the temporary jacking system and the selection of the jack, but under no circumstances shall the horizontal design load be taken as less than 10% of the Design Jacking Load. The Contractor shall consider thermal forces or translations in the temporary jacking system where temporary support of the Girder(s) extends for greater than twelve (12) hours.

D. No materials shall be ordered and no work shall be performed until the Engineer's written approvals have been obtained. Approval by the Engineer shall in no way relieve the Contractor of responsibility for the safety and adequacy of the temporary jacking systems. Any damage to any portion of the existing structure to remain in place resulting from the Contractor's use of the temporary jacking system shall be repaired to the satisfaction of the Engineer and at no additional cost to the Metro North.

E. For applications where new overpass bolsters are to be installed, no jacking shall be performed until the replacement bolster assembly and all appurtenant materials required for installation at each specific location are on-site and ready for installation.

F. For applications where existing support systems are to be reset, no jacking shall be performed until all tools and materials required to resetting the bolsters are on-site and ready for use.

G. Where all bolsters are to be reset, the Contractor shall pre-position all subsequently installed bolsters within that support line such that they exhibit a deflected shape to match any thermal movement observed at the bearing(s) already installed. Thermal deflection differences for all bearings at a bearing line shall be limited to a tolerance of +/- 1/8" as measured from the first bearing installed.

H. The amount of jacking movement used to release and replace each bearing shall be kept to a minimum. The Contractor shall submit to the Engineer, at least 30 days prior to the start of jacking operation, the methods to be used and the procedures to be followed for the jacking operation intended for the resetting of the new bolsters used to raise the overpass. The Contractor must receive written approval of these methods before commencing work.

I. Jacks, bolsters and other devices required by the Contractor shall be used to maintain the structural steel at the correct elevations and positions and to be able to align the structural steel during erection to ensure full mating of milled contact surfaces and to properly ream and bolt splices and connections.

J. The following requirements and restrictions shall be closely adhered to by the Contractor during jacking operations:
   1. A girder may not be raised more than ¼" above finished elevation unless otherwise allowed by the written permission of the Engineer.
   2. Jacking systems shall not be utilized to support the weight of the superstructure at any one bearing for more than twelve (12) hours. New or refurbished bolsters, new anchor bolts, and all appurtenant materials and hardware necessary to provide a complete and functional bearing assembly shall be installed and ready to support the overpass structure within this time frame unless otherwise permitted by the Engineer. The noted twelve (12) hour time frame shall begin when the temporary jacking system hydraulics are pressurized, and shall end when the overpass superstructure bears its full load on the new permanent bearing system and no pressure is present in the temporary jacking system hydraulics.
   3. Jack hydraulics may not be used to support the loads after jacking the Girder. All loads must be transferred to an approved temporary support mechanism or the jacks must have secured lock nuts.
   4. Jacks with higher capacity than required may be allowed, but the Contractor shall be responsible for monitoring the jack loads to ensure the safety of the structure. The larger jack

may alter loading distribution and eccentricity and thereby require dimensional or design changes to the temporary jacking system.

5. The jack system shall be equipped with direct reading gages to read the jack force in pounds or kips. Jacks shall be calibrated within the past 90 calendar days. The Contractor shall furnish proof of calibration or shall calibrate the jacks in the presence of the Engineer.
6. The Contractor shall monitor the temporary jacking system for possible deflection, settlement, or yielding of the jacking system components.
7. The Contractor shall furnish, in writing, the anticipated loading at each jack location. Where jacking operations incur jack loads in excess of 110% of the anticipated loads, jacking operations shall be immediately suspended and the Engineer shall be immediately notified.
8. The Contractor shall provide, at no additional cost to the Metro North, a Professional Engineer registered in the State where the work will be performed, to be present at all jacking operations and to check pertinent dimensions and requirements set forth on the Plans, the approved Shop Drawings, and herein to certify that all stipulations are met before the actual commencement of jacking.
9. Jacking systems may not be removed from service until such time as is the shim devices and bolsters are fully installed and permanently attached to both the supported Girder and supporting framework as per the Contract Drawings.
10. Re-use of jacks and jacking system components shall be subject to the approval of the Engineer. Temporary jacking system components and/or equipment which is damaged, in poor condition, or otherwise deemed unsuitable for use in the sole opinion of the Engineer shall not be used and shall be removed from the site.
11. The Contractor's attention is directed to the fact that it is of extreme importance to safeguard temporary support systems. It will be the sole responsibility of the Contractor to provide and maintain adequate protection of the temporary support systems for the duration of the Contract.
12. All residue, debris, or waste materials generated during the execution of the work to be performed shall be removed from the site and legally disposed of. The work area shall be cleaned and restored to the satisfaction of the Engineer.
13. Upon completion of the structural steel erection, the Contractor shall dismantle and remove the temporary supports from their locations. Areas disturbed by the temporary supports shall be restored to the satisfaction of the Engineer. Upon removal of the temporary supports from their locations, all materials for the temporary supports shall become the property of the Contractor.

K. The following requirements pertain to hours of work and passenger movements

1. Temporary support installation work will only be permitted during nights, and weekend hours.
2. The Contractor shall maintain passenger flow throughout the platforms at all times.
3. Should the platforms require partial demolition to provide space to install temporary supports, the Contractor is to ensure total protection from any cut, or open platform sections, to maintain passenger flow in accordance with K.2. above.
4. Jacking operations shall consist of simultaneous lifts for both the overpass, and the attached stairs at the inbound platform area.
5. Should the jacking operation not coincide with the construction of the new inbound platform; a semi-permanent, ADA compliant, riser and tread shall be permanently affixed to the raised, bottom step of the lifted stairwells. This shall provide a semi-permanent solution to any differences in time between the completion of the jacking operation, and the construction of the new inbound platform.

6. The jacking operation itself shall be limited to one weekend, with a maximum duration between 11:00 PM on a Friday, to completion at 4:00 AM on the following Monday (53 hour contiguous).
7. Completion is to include the full, safe, ADA compliant access for passengers at that time. Under no circumstances shall the Contractor be allowed to exceed this one-time duration.
8. The Contractor is alerted to an existing fence under the platform at the location of the temporary support. This chain-link fence shall be maintained or replaced with another temporary enclosure to ensure that there is no access to the underside of the platform at any time during the jacking operation, with the exception of access needed to install and remove the temporary support.

END OF SECTION

SECTION 05 99 20

JACKING OPERATIONS

APPENDIX "A"

SUBMITTALS

Submit the following in accordance with the requirements of "Shop Drawings, Catalog Cuts and Samples" of Division 1 – GENERAL PROVISIONS:

A. WORKING DRAWINGS

Furnish working drawings, prepared, stamped and signed by a Professional Engineer licensed in the State of New York for the system utilized to raise, support and lower each designated bearing point. The working drawings shall not alter the number or location of designated bearing points.

The drawings shall include, but need not be limited to the following:

1. Lift point locations.

2. Calculated lifting forces.

3. Details for all lifting equipment and support systems.

4. Type and grade of all materials.

5. Distance that each bearing point is to be raised.

6. Schematic hydraulic layout.

7. All disconnections, reconnections or adjustments that are necessary to properly complete the lifting operations. This includes but is not limited to railings, joints, power lines, gas lines, water lines, etc.

8. Sequence of jacking and monitoring procedures.

9. Design calculation for all lifting equipment and temporary support systems.

10. Work area protection details and drawings.

11. Design and calculation for strengthening existing steel.

12. Details for removing existing bearings.

13. Temporary support devices.

B. Catalog Cuts, Material Certification and Test Results

1. Catalog cuts and manufacturer's information on jack type, capacity, safe working load and safe lifting height.

C. Submit procedures and methods to show how the simultaneous lift as shown on the Contract Drawings will be accomplished and monitor.

D. Submit procedures and methods to provide monitoring for temporary support devices.

SECTION 06 10 00 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Framing with dimension lumber.
2. Timber Edge Boards

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

C. Research/Evaluation Reports: For the following, showing compliance with the New York State Building Code:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Power-driven fasteners.
5. Powder-actuated fasteners.
6. Expansion anchors.
7. Metal framing anchors.

1.5 QUALITY ASSURANCE

A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.

3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C1, using a Wolmanizing process using CCA.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat items indicated on Drawings, including timber edge board.

2.3 DIMENSION LUMBER FRAMING

A. Maximum Moisture Content: 15 percent for 2-inch nominal (38-mm actual) thickness or less, 19 percent for more than 2-inch nominal (38-mm actual) thickness.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Timber Edge Board:
1. Install two 2x8 CCA treated Southern Pine boards to all trackside edges of platform.

2. Fasteners are to be staggered as shown on the Contract Drawings:

a. In the topping: ½" diameter bolt, drilled and grouted after pour.
b. In the precast plank: ½" diameter bolt, secured to anchor cast-in to plank.

3. Attach outer board to inner board using #10 Galvanized Steel nails as shown in the Drawings.

3.2 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 07 14 16 - COLD FLUID APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Polyurethane waterproofing.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site
   1. Review waterproofing requirements including, but not limited to, the following:
      a. Surface preparation specified in other Sections.
      b. Minimum curing period.
      c. Forecasted weather conditions.
      d. Special details and sheet flashings.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
   2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings:
   1. Show locations and extent of waterproofing.
   2. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.
   1. Build mockup for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, and protection.
      a. Size: 100 sq. ft.
      b. Description: Each type of wall installation.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer.
   1. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.
   2. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.8 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace waterproofing that fails in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

B. Installer's Special Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of two years.
   1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pavers on plaza decks.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials from single source from single manufacturer.

B. Two-Component, Unmodified Polyurethane Waterproofing:
   1. Manufacturer
      a. Carlisle Coatings
      b. Tremco Incorporated
      c. Gaco Western LLC
      d. Or approved equal

2.2 AUXILIARY MATERIALS

A. General: Provide auxiliary materials recommended in writing by waterproofing manufacturer for intended use and compatible with one another and with waterproofing.
   1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Manufacturer's standard primer, sealer, or surface conditioner; factory-formulated acrylic latex, polyurethane, or epoxy.

C. Sheet Flashing: 50-mil- minimum, nonstaining, uncured sheet neoprene.
   1. Adhesive: Manufacturer's recommended contact adhesive.

D. Joint Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.

E. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing; and as recommended by manufacturer for substrate and joint conditions.
   1. Backer Rod: Closed-cell polyethylene foam.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
   1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
   2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, acid residues, and other penetrating contaminants or film-forming coatings from concrete.

E. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, holes, and other voids.

3.3 PREPARATION AT TERMINATIONS, PENETRATIONS, AND CORNERS

A. Apply waterproofing in two separate applications, and embed a joint reinforcing strip in the first preparation coat when recommended by waterproofing manufacturer.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrate according to waterproofing manufacturer's written instructions and to recommendations in ASTM C 898Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.
   1. Extend sheet flashings for 4 inches onto perpendicular surfaces and items penetrating substrate.

3.5 WATERPROOFING APPLICATION

A. Start installing waterproofing in presence of manufacturer's technical representative.

B. Apply primer over prepared substrate unless otherwise instructed in writing by waterproofing manufacturer.

C. Unreinforced Waterproofing Applications: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.
   1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases and pinholes, with a dry film thickness of 90 mils
   2. Apply waterproofing to prepared wall terminations and vertical surfaces.
   3. Verify manufacturer's recommended wet film thickness of waterproofing every 100 sq. ft.

D. Cure waterproofing, taking care to prevent contamination and damage during application and curing.

E. Install protection course with butted joints over waterproofing before starting subsequent construction operations.
   1. For horizontal applications, install protection course loose laid over fully cured membrane.
   2. For vertical applications, set protection course in nominally cured membrane, which will act as an adhesive. If membrane cures before application of protection course, use adhesive.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections:
   1. Testing agency shall verify thickness of waterproofing during application for each 600 sq. ft. of installed waterproofing or part thereof.

B. Manufacturer's Field Service: Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components and to furnish daily reports to Engineer.

C. If test results or inspections show waterproofing does not comply with requirements, remove and replace or repair the waterproofing as recommended in writing by manufacturer, and make further repairs after retesting and inspecting until waterproofing installation passes.

D. Prepare test and inspection reports.

3.7 PROTECTION

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION

SECTION 07 19 00 - LITHIUM SILICATE SEALER

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies requirements for material and application of Penetrating Lithium Silicate Sealer for existing or new concrete surfaces.

1.2 REFERENCES

A. The following is a listing of the publications referenced in this Section:
   1. American Society for Testing and Materials:
      a. ASTM C 642: Test Method for Specific Gravity, Absorption, and Voids in Hardened Concrete

   2. National Cooperative Highway Research Program (NCHRP):
      a. REPORT 244: Concrete Sealers for Protection of Bridge Structures

1.3 SUBMITTALS

A. Submit to the Engineer, one-quart sample of the sealer for approval.

B. Submit the manufacturer's specifications, installation instructions, general recommendations, Shop Drawings, Catalog Cuts, MSDS and Samples to the Engineer.

C. Submit to the Engineer, certification of compliance with the Volatile Organic Compounds (VOC) regulations of the state or city in which the application will occur.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance.

B. Do not apply sealer to a wet surface. Surfaces must dry at least 24 hours following rain, water cleaning or other moisture.

C. Do not apply the sealer when ambient temperature is 40 degrees F, or below, except where the manufacturer establishes a lower limit for applicable.

D. Do not apply the sealer in direct sunlight when ambient temperature is 90 degrees F, or higher.

E. Do not apply the sealer until fresh concrete has cured for a minimum of 28 days. All fresh mortar shall be cured a minimum of three (3) weeks prior to application of the sealer.

F. Do not apply the sealer where there are high winds that would cause an improper application or curing rate.

1.5 LIFE SAFETY AND MATERIAL SAFETY MEASURES

A. Close areas to traffic during and after application for the time period recommended in writing.

B. Protect all plants and vegetation from damage by product spillage, overspray and/or drippage.

C. Personnel shall be warned against prolonged breathing of vapors and contact of materials with skin or eyes.

D. Do not apply on or near plastic or specialty-coated glass without adequately protecting these surfaces. If there is a question concerning the sealer's compatibility with such material, a test and evaluation shall be made prior to general application. Contractor shall provide adequate protection for glazed openings in general.

E. Caution shall be taken near all asphalt-based materials and painted surfaces, as the solvent carrier in the sealer may attack these materials. Use drop cloths or mask off areas as required.

F. Protect adjacent finish materials against spillage, overspray and/or drippage during application.

1.6 QUALITY CONTROL/ASSURANCE

A. Installer Qualifications: Only use a manufacturer approved or recommended applicator and an adequate number of skilled workmen who are thoroughly trained and experienced in the grinding, and application of the sealer.

B. At locations determined by the Engineer, the Contractor shall perform one test installation to demonstrate his ability in performing the work in strict compliance with the requirements of this Section and to the satisfaction of the Engineer. The Contractor shall submit the plan for testing to the Engineer for approval. The sample test installation shall be performed in the same manner as proposed for production work. The production work shall be performed after approval of the test installation. Apply Test Application of each type finish, to demonstrate typical joints, surface finish, color variation (if any), and standard of workmanship.

1. The Contractor shall take 2" diameter core samples in the platform deck at locations ordered by the Engineer. A maximum of two cores shall be taken in each platform. Cores shall be taking after the designated cure time of the sealer. For acceptance, the cores shall show evidence of 0.1-inch minimum surface penetration and 85% reduction in water absorption, per ASTM C 642 entitled "A Test Method for Specific Gravity Absorption and Voids in Hardened Concrete." Core holes shall be patched by the Contractor in an

approved method and finished to match adjacent surfaces to the satisfaction of the Engineer.

C. Where results from test installations or Engineer's sampling are found to be unacceptable, the Contractor shall propose a method for correcting all unacceptable work, correct the work to the satisfaction of the Engineer and take those measures necessary to assure that all subsequent repair work will be acceptable, all at no additional cost to Metro North. Measures shall include any or all of the following: modification of equipment, changing repair materials, or employment of more competent personnel.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver the sealer to the construction site in its original, unopened containers with the manufacturer's lot numbers clearly marked on the containers. Include with the delivery a manufacturer's invoice stating the date(s) of shipment and lot numbers of the sealer to be used.

B. Store the sealer at ambient temperatures in accordance with the manufacturer's recommendation.

C. The sealer, which has been in storage more than the time recommended by the manufacturer, shall not be used and shall be removed from the construction site immediately.

1.8 WARRANTY

A. Contractor shall obtain and provide for Metro-North/Engineer review, the manufacturer's Service Agreement, Limited Material Warranty and Product Warranty. Contractor shall perform work in accordance with manufacturer's requirement in order to secure said warranty.
   1. If required by the manufacturer for warranty purposes, Contractor shall provide for an on-site inspector acceptable to the manufacturer during the application of the sealer to insure proper coverage rates and provide field quality control services, as required by manufacturer.
   2. Copies of the field inspector's reports shall be submitted to the Engineer upon completion of application.

PART 2 - PRODUCTS

2.1 MATERIALS

A. SS Harden X SI, as manufactured by:

   1. SealSource International
   2. 348 W Center St, Orem, Utah 84057
   3. Contact: Kym Nelson 801.224.3800 or Darin Nelson 801.224.3800
   4. knelson@sealsource.com / dnelson@sealsource.com

B. PROPERITIES: Sealer properties shall be as follows, when tested on standardized laboratory specimens:
   1. Form clear, light amber, water-based solution
   2. Shelf Life 1 year in factory sealed container
   3. Total Solids 17%
   4. Active Ingredients 100% of total solids
   5. Specific Gravity 1.10
   6. pH 11.0
   7. Flash Point N/A
   8. VOC Content 50<gms/L; 0 lbs/gal; or 0 g/L per gallon
   9. Freeze Point 32 Degrees F (0 degrees C)
   10. Slip Resistance does not change floor friction coefficient
   11. Depth of Surface Penetration 2-8 mm

2.2 SUBSTITUTIONS: Engineer's approved equal. Requests for an approved equal shall include laboratory data showing compliance with specified properties and at least a 94% reduction in absorbed chlorides when tested in accordance with the procedures of NCHRP Report 244, "Concrete Sealers for Protection of Bridge Structures, Series IV, Southern Exposure," and 75% weight gain reduction due to water absorption in accordance with Series II.

PART 3 - EXECUTION

3.1 PREPARATION

A. SURFACE PREPARATION: Verify that surfaces are solid, dry, free of frozen matter, loose particles, cracks, pits, laitance, curing compounds and other foreign matter that may inhibit the absorption of the sealer. Clean and prepare substrate by removing contaminants that would block pores of the surface and interfere with penetration/adhesion of the sealer. Pressure-wash surfaces to receive the sealer. Floor surface shall be completed using an auto scrubber with scrubbing and pickup capability. A minimum of 2 passes shall be used on all surfaces to accept sealer/hardener. Prior to sealer application, surfaces shall be dry and free of dirt, grease and oil.

B. Vacuum surfaces after cleaning to remove all residue, dirt, sand and grit. Dispose of material off of Metro-North property.

C. Verify that caulking and sealant materials are completely cured.

D. Protect adjoining construction, persons, motor vehicles and surrounding buildings from spillage or over-spray of sealer prior to commencement of application. Cover metals and glass where there is the possibility of the sealer being deposited on the surface. Cover live plants and vegetation with drop cloths. Mask off adjacent surfaces not scheduled to receive the sealer application. Mask manholes, drains and other construction not to be sealed. Clean the sealer from adjoining surfaces immediately after spillage. Comply with manufacturer's recommendations for cleaning.

E. Do not seal freshly placed concrete until it has cured a minimum of 28 days, nor fresh mortar until it has cured a minimum of three (3) weeks.

3.2 APPLICATION

A. GENERAL
1. Apply the sealer in strict accordance with manufacturer's application instructions and coverage rate.
2. Do not alter or dilute material. Do not apply to a wet substrate. The Contractor shall coordinate with the manufacturer's representative the application of test patches to the substrate to be examined and evaluated by the manufacturer's representative to verify coverage rate and application conditions.
3. On vertical surfaces verify with the manufacturer's representative. Provide adequate protection of materials below application area not scheduled to be treated.
4. Apply sealer on surfaces to be sealed in two complete applications where shown on the Contract Drawings.
5. Protect treated surfaces from contact with precipitation a minimum of two (2) hours following application.

3.3 FIELD QUALITY CONTROL

A. ON-SITE INSPECTOR: Upon obtaining a Service Agreement from the manufacturer and if required by the manufacturer in order to meet the requirements of the warranty, Contractor shall provide an on-site inspector acceptable to the manufacturer during the application of the sealer.

B. REPORT: Copies of the field inspector's report shall be submitted to the Contractor and Engineer upon completion of application.

C. The premises shall be kept clean and free of debris at all times.

D. Protect all adjacent surfaces from work related spatter.

E. Repair damages to surface caused by cleaning, grinding and polishing operations.

F. Remove debris from jobsite. Dispose of materials in separate, closed containers as provided by the owner, and in accordance with local regulations.

3.4 MAINTENEANCE

A. Follow manufacturer's maintenance recommendations for cleaning.

3.5 GUARANTEE

A. The Contractor shall extend a written guarantee to Metro-North that said Contractor shall be responsible for any defective materials and workmanship installed by him for a period of five (5) years. The period of Guarantee shall start from the date of Metro-North's acceptance of the work. The Contractor further guarantees to make permanent repairs forthwith to restore defective areas, and to make repairs without reference to or consideration of the cause of any defects in the work.

END OF SECTION

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Extruded polystyrene foam-plastic board.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.4 SUBMITTALS:

A. Submit in accordance with Division 1 Submittals

B. Manufacturer's Literature and Data:
   1. Insulation, each type
   2. Fastening requirements

C. Certificates:
   1. Indicating type, thickness and thermal conductance of insulation. (Average thickness for tapered insulation).

D. Laboratory Test Reports: Thermal values of insulation products.

1.5 QUALITY ASSURANCE:

A. Insulation shall be approved for local use.

B. Source Limitation: Obtain each type of roof insulation through one source.

C. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having

jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:
1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.

B. Extruded Polystyrene Board, Type IV: ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Dow Chemical Company (The).
   b. DiversiFoam Products.
   c. Owens Corning.
   d. Pactiv Corporation.
   e. Or, Engineer’s Approved Equal
2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

C. Extruded Polystyrene Board, Type VI (roof): ASTM C 578, Type VI, 40-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dow Chemical Company (The).
b. DiversiFoam Products.
c. Owens Corning.
d. Pactiv Corporation.
e. Soprema, Inc.
f. or, Engineer's Approved Equal

2.2 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. AGM Industries, Inc.
   a. Gemco.
   b. Or, Engineer's Approved Equal.
3. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
4. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
1. Manufacturers: Subject to compliance with requirements, provide products by the following::
   a. Gemco.
   b. Or, Engineer's Approved Equal.
2. Angle: Formed from 0.030-inch-thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
1. Manufacturers: Subject to compliance with requirements, provide products by the following::
   a. AGM Industries, Inc.
   b. Gemco.
   c. Or, Engineer's Approved Equal.
2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
3. Crawl spaces.
   a. Ceiling plenums.
   b. Attic spaces.

D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch between face of insulation and substrate to which anchor is attached.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Gemco.
      b. Or, Engineer's Approved Equal.

E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following::
      a. AGM Industries, Inc.
      b. Gemco.
      c. Or, Engineer's Approved Equal.

2.3 ACCESSORIES

A. Insulation for Miscellaneous Voids:
   1. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

B. Asphalt Coating for Cellular-Glass Block Insulation: Cutback asphalt or asphalt emulsion of type recommended by manufacturer of cellular-glass block insulation.

C. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

END OF SECTION

SECTION 07 53 23 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.1 SUMMARY

A. Contractor to provide Manufacturer's letter of installation, including all components and systems required for a fully warranted roof system. Contractor to adhere to all requirements and produce a fully inspected, approved and signed-off system by the Manufacturer.

B. Furnish and install elastomeric sheet roofing system, including:

1. Roofing manufacturer's requirements for the specified warranty.
2. Preparation of roofing substrates.
3. Wood nailers for roofing attachment.
4. Vapor barrier (optional).
5. Insulation.
6. Elastomeric EPDM membrane roofing.
7. Metal roof edging and copings.
8. Flashings.
9. Walkway pads.
10. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system.

C. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.

D. Comply with the published recommendations and instructions of the roofing membrane manufacturer, at http://manual.fsbp.com .

E. Commencement of work by the Contractor shall constitute acknowledgement by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. Any modification of the Contract Sum will be made in accordance with the stipulations of the Contract Documents stated elsewhere.

1.2 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry: Wood nailers associated with roofing and roof insulation.

B. Section 07 60 00 - Flashing and Sheet Metal: Formed metal flashing and trim items associated with roofing.

C. Section 07 72 00 - Roof Accessories: Roof hatches, vents, and manufactured curbs.

1.3 REFERENCES

A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.

1. ASTM C 1177/C 1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2006.

2. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2013.

3. ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

4. ASTM D 4637 - Standard Specification for EPDM Sheet used in Single-Ply Roof Membrane; 2004.

5. ASTM D 4811 - Standard Specification for Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing; 2004.

6. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.

7. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.

8. FM 1-28 - Design Wind Loads; Factory Mutual System; 2007.

9. FM 1-29 - Roof Deck Securement and Above Deck Roof Components; Factory Mutual System; 2006.

10. FM 4470 - Approval Standard - Class I Roof Covers; current version.

11. PS 1 - Construction and Industrial Plywood; 2009.

12. PS 20 - American Softwood Lumber Standard; 2010.

13. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2007. (ANSI/SPRI ES-1).

1.4 SUBMITTALS

A. Product Data:

1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.

2. Where UL or FM requirements are specified, provide documentation that shows that the roofing system to be installed is UL-Classified or FM-approved, as applicable; include data itemizing the components of the classified or approved system.

3. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.

B. Shop Drawings: Provide:

1. The roof membrane manufacturer's standard details customized for this project for all relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.

C. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.

D. Executed Warranty as a requirement of project close-out.

E. Specimen Warranty: Submit prior to starting work.

F. Samples: Submit samples of each product to be used.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Roofing installer shall have the following:

1. Current Firestone Master Contractor status.

2. At least five years experience in installing specified system.

3. Capability to provide payment and performance bond to building owner.

B. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.

1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
2. Notify Architect well in advance of meeting.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Store materials clear of ground and moisture with weather protective covering.

C. Keep combustible materials away from ignition sources.

1.7 WARRANTY

A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

B. Warranty: 30 year Warranty covering membrane, roof insulation, and membrane accessories.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer - Roofing System: Firestone Building Products Co., Carmel, IN. www.firestonebpco.com.

1. Roofing systems manufactured by others may be acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets the following qualifications:

a. Specializing in manufacturing the roofing system to be provided.

b. Minimum ten years of experience manufacturing the roofing system to be provided.

c. Able to provide a no dollar limit, single source roof system warranty that is backed by corporate assets in excess of one billion dollars.

d. ISO 9002 certified.

e. Able to provide isocyanurate insulation that is produced in own facilities.

B. Manufacturer of Insulation and Cover Board: Same manufacturer as roof membrane.

C. Manufacturer of Metal Roof Edging: Same manufacturer as roof membrane.

1. Metal roof edging products by other manufacturers are not acceptable.

2. Field- or shop-fabricated metal roof edgings are not acceptable.

D. Substitution Procedures: See Instructions to Bidders.

1. Submit evidence that the proposed substitution complies with the specified requirements.

2.2 ROOFING SYSTEM DESCRIPTION

A. Roofing System:
1. Membrane: Ethylene propylene diene monomer (EPDM).
2. Thickness: As specified elsewhere.
3. Membrane Attachment: Fully adhered.
4. Slope: Deck is sloped but not enough; provide additional slope of 1/4 inch per foot (1:48) by means of tapered insulation.
5. Comply with applicable local building code requirements.
6. Provide assembly having Underwriters Laboratories, Inc. (UL) Class A Fire Hazard Classification.

7. Provide assembly complying with Factory Mutual Corporation (FM) Roof Assembly Classification, FM DS 1-28 and 1-29, and meeting minimum requirements as per manufacturer recommendations.

B. Vapor Barrier over deck/deck cover:
1. Membrane: High density polyethylene sheet with SBS modified bitumen adhesive.
2. Attachment: Self adhering.

C. Insulation:
1. Total System R Value: 25 or greater.
2. Maximum Board Thickness: 2 inches (50 mm); use as many layers as necessary; stagger joints in adjacent layers.
3. Base Layer: Polyisocyanurate foam board, non-composite.
   a. Attachment: Mechanical fastening, Low-rise polyurethane adhesive.
4. Top Layer: Polyisocyanurate foam board, non-composite.
   a. Attachment: Mechanical fastening, Low-rise polyurethane adhesive.

C. Cover Board: High Density Polyisocyanurate Cover Board:

1. Thickness: 0.5 inch (12.7mm).

2. R-Value: 2.5 based on ASTM tests C158 and C177.

   a.Attachment: Mechanical fastening, Low-rise polyurethane adhesive.

2.3 EPDM MEMBRANE MATERIALS

A. Roofing and Flashing Membrane: White cured synthetic single-ply membrane composed of ethylene propylene diene terpolymer (EPDM) with the following properties:
1. Thickness: 0.060 inch (1.5 mm).
2. Reinforcement: Polyester weft inserted scrim; membrane complying with ASTM D 4637 Type II.
3. Nominal Thickness Tolerance: Plus/minus 10 percent.
4. Sheet Width: Provide the widest available sheets to minimize field seaming.
5. Acceptable Product: RubberGard Reinforced EPDM Membrane by Firestone. [black membrane only]

B. Membrane Fasteners: Type and size as required by roof membrane manufacturer for roofing

system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

C. Flashing Membrane: Self-curing, non-reinforced membrane composed of nonvulcanized EPDM rubber, complying with ASTM D 4811 Type II, and with the following properties:
   1. Thickness: 0.055 inch (1.4 mm).
   2. Color: Same as field membrane
   3. Acceptable Product: RubberGard EPDM FormFlash by Firestone.

D. Self-Adhesive Flashing Membrane: Semi-cured 45 mil EPDM membrane laminated to 35 mil (0.9 mm) EPDM tape adhesive; QuickSeam Flashing by Firestone.

E. Pre-Molded Pipe Flashings: EPDM, molded for quick adaptation to different sized pipes; Firestone EPDM Pipe Flashing.

F. Self-Adhesive Lap Splice Tape: 35 mil (0.9 mm) EPDM-based, formulated for compatibility with EPDM membrane and high-solids primer; QuickSeam Splice Tape by Firestone.

G. Splice Adhesive: Synthetic polymer-based, formulated for compatibility with EPDM membrane and metal surfaces; SA-1065 Splice Adhesive by Firestone.

H. Bonding Adhesive: Neoprene-based, formulated for compatibility with EPDM membrane and wide variety of substrate materials, including masonry, wood, and insulation facings; Bonding Adhesive BA-2004 by Firestone.

I. Adhesive Primer: Synthetic rubber based primer formulated for compatibility with EPDM membrane and tape adhesive, with VOC content less than 2.1 lb/gal (250 g/L); QuickPrime Plus LVOC by Firestone.

J. Low Rise Foam Adhesive: Two-component, low-rise polyurethane adhesive designed to attach polyisocyanurate insulation to a variety of acceptable substrates; ISO Stick by Firestone.

K. Seam Edge Treatment: EPDM rubber-based sealant, formulated for sealing exposed edges of membrane at seams; Lap Sealant HS by Firestone.

L. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing; Pourable Sealer by Firestone.

M. Water Block Seal: Butyl rubber sealant for use between two surfaces, not exposed; Water Block Seal by Firestone.

N. Metal Plates and Strips Used for Fastening Membrane and Insulation: Steel with Galvalume coating; corrosion-resistance meeting FM 4470 criteria.
   1. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches (33 mm) wide by 0.10 inch (2.5 mm) thick; Firestone Termination Bar by Firestone.

O. Roof Walkway Pads: EPDM, 0.30 inch (7.6 mm) thick by 30 by 30 inches (760 by 760 mm) with EPDM tape adhesive strips laminated to the bottom; QuickSeam Walkway Pads by Firestone.

P. Yellow Safety Strip: To designate areas of caution on the roof or around rooftop objects. 5.5

inches wide (140 mm) by 100 feet long (30 m) strip and nominal 30 mil (0.76 mm) thick yellow TPO membrane laminated to a white, cured, seam tape. Compatible with TPO and EPDM; QuickSeam Yellow Safety Strip by Firestone.

2.4 ROOF INSULATION AND COVER BOARDS

A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C 1289 Type II Class 1, with the following additional characteristics:
   1. Thickness: As indicated elsewhere.
   2. Size: 48 inches (1220 mm) by 96 inches (2440 mm), nominal.
      a. Exception: Insulation to be attached using adhesive or asphalt may be no larger than 48 inches (1220 mm) by 48 inches (1220 mm), nominal.
   3. R-Value (LTTR): 1.0 inch (25 mm) Thickness: 5.7, minimum.
   4. Compressive Strength: 20 psi (138 kPa) when tested in accordance with ASTM C 1289.
   5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
   6. Recycled Content: 19 percent post-consumer and 15 percent post-industrial, average.
   7. Acceptable Product: ISO 95+ polyiso board insulation by Firestone

B. High Density Polyisocyanurate Cover Board: Non-combustible, water resistant high density, closed cell polyisocyanurate core with coated glass mat facers, complying with ASTM D 1623, and with the following additional characteristics:
   1. Size: 48 inches (1220 mm) by 96 inches (2440 mm), nominal.
      a. Exception: Board to be attached using adhesive or asphalt may be no larger than 48 inches (1220 mm) by 48 inches (1220 mm), nominal.
   2. Thickness: 0.5 inch (12.7mm).
   3. R-Value: 2.5 based on ASTM tests C158 and C177.
   4. Surface Water Absorption: <3%, maximum, when tested in accordance with ASTM C 209.
   5. Compressive Strength: 120psi, when tested in accordance with ASTM 1621.
   6. Density: 5pcf, when tested in accordance with ASTM 1622.
   7. Factory Mutual approved for use with FM 1-60 and 1-90 rated roofing assemblies.
   8. Mold Growth Resistance: Passed, when tested in accordance with ASTM D 3273.
   9. Acceptable Product: ISOGARD HD Cover Board by Firestone.

C. Gypsum-Based Cover Board: Non-combustible, water resistant gypsum core with embedded glass mat facers, complying with ASTM C 1177/C 1177M, and with the following additional characteristics:
   1. Size: 48 inches (1220 mm) by 96 inches (2440 mm), nominal.
      a. Exception: Board to be attached using adhesive or asphalt may be no larger than 48 inches (1220 mm) by 48 inches (1220 mm), nominal.
   2. Thickness: 0.5 inch (12.7mm).
   3. Surface Water Absorption: 2.5 g, maximum, when tested in accordance with ASTM C 473.
   4. Spanning Capability: Recommended by manufacturer for following minimum flute spans:
   5. Surface Burning Characteristics: Flame spread of 0, smoke developed of 0, when tested in accordance with ASTM E 84.
   6. Combustibility: Non-combustible, when tested in accordance with ASTM E 136.
   7. Factory Mutual approved for use with FM 1-60 and 1-90 rated roofing assemblies.
   8. Mold Growth Resistance: Zero growth, when tested in accordance with ASTM D 3273 for minimum of 4 weeks.

D. Insulation Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

E. Adhesive for Insulation Attachment: Type as required by roof membrane manufacturer for roofing system and warranty to be provided; use only adhesives furnished by roof membrane manufacturer.

2.5 VAPOR BARRIER

A. Vapor Barrier Membrane: Comprised of SBS modified bitumen adhesive, factory-laminated to a tri-laminate woven, high-density polyethylene top surface. Release liner protecting adhesive.
   1. Intended for use as a direct to deck air/vapor barrier in roofing systems and may be used as a temporary roof membrane for up to ninety (90) days.
   2. Thickness: 0.0325" (0.826 mm) minimum, when tested in accordance with ASTM D 5147.
   3. Max Load at Break at 73 °F (23 °C): 64 lbf/in, MD (11 kN/m) 88 lbf/in, XMD (15 kN/m) when tested in accordance with ASTM D 5147.
   4. Low Temperature Flexibility: -30 °F (-34 °C) when tested in accordance with ASTM D 5147.
   5. Moisture Vapor Permeance, 0.02 Perms (0.92 Ng/Pa•s•m2) maximum, when tested in accordance with ASTM E 96.
   6. Air Permeability: 0.00114 ft3/min•ft2 (0.007 L/sec•m2) maximum, when tested in accordance with ASTM E 2178.

B. Acceptable Product: V-Force Vapor Barrier Membrane by Firestone.

2.6 METAL ACCESSORIES

A. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer.
   1. Wind Performance:
      a. Membrane Pull-Off Resistance: 100 lbs/ft (1460 N/m), minimum, when tested in accordance with ANSI/SPRI ES-1 Test Method RE-1, current edition.
      b. Fascia Pull-Off Resistance: At least the minimum required when tested in accordance with ANSI/SPRI ES-1 Test Method RE-2, current edition.
      c. Provide product listed in current Factory Mutual Research Corporation Approval Guide with at least FM 1-270 rating.
   2. Description: Two-piece; 45 degree sloped galvanized steel sheet edge member securing top and bottom edges of formed metal fascia; Firestone EdgeGard.
   3. Fascia Face Height: 5 inches (127 mm).
   4. Edge Member Height Above Nailer: 1-1/4 inches (31 mm).
   5. Fascia Material and Finish: 24 gage, 0.024 inch (0.06 mm) galvanized steel with Kynar 500 finish in manufacturer's standard color; matching concealed joint splice plates; factory-installed protective plastic film.
   6. Length: 144 inches (3650 mm).
   7. Functional Characteristics: Fascia retainer supports while allowing for free thermal cycling of fascia.
   8. Aluminum Bar: Continuous 6063-T6 alloy aluminum extrusion with pre-punched slotted holes; miters welded; injection molded EPDM splices to allow thermal expansion.

9. Anchor Bar Cleat: 20 gage, 0.036 inch (0.9 mm) G90 coated commercial type galvanized steel with pre-punched holes.
10. Curved Applications: Factory modified.
11. Fasteners: Factory-provided corrosion resistant fasteners, with drivers; no exposed fasteners permitted.
12. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, scuppers, and end caps; minimum 14 inch (355 mm) long legs on corner pieces.
13. Scuppers: Welded watertight.
14. Accessories: Provide matching brick wall cap, downspout, extenders, and other special fabrications as shown on the drawings.

B. Parapet Copings: Formed metal coping with galvanized steel anchor/support cleats for capping any parapet wall; watertight, maintenance free, without exposed fasteners; butt type joints with concealed splice plates; mechanically fastened as indicated; Firestone PTCF.
   1. Wind Performance:
      a. At least the minimum required when tested in accordance with ANSI/SPRI ES-1 Test Method RE-3, current edition.
      b. Provide product listed in current Factory Mutual Research Corporation Approval Guide with at least FM 1-90 rating.
   2. Description: Coping sections allowed to expand and contract freely while locked in place on anchor cleats by mechanical pressure from hardened stainless steel springs factory attached to anchor cleats; 8 inch (200 mm) wide splice plates with factory applied dual non-curing sealant strips capable of providing watertight seal.
   3. Material and Finish: 24 gage, 0.024 inch (0.06 mm) thick galvanized steel with Kynar 500 finish in manufacturer's standard color; matching concealed joint splice plates; factory-installed protective plastic film.
   4. Dimensions:
      a. Wall Width: As indicated on the drawings.
      b. Piece Length: Minimum 144 inches (3650 mm).
      c. Curved Application: Factory fabricated in true radius.
   5. Anchor/Support Cleats: 20 gage, 0.036 inch (0.9 mm) thick prepunched galvanized cleat with 12 inch (305 mm) wide stainless steel spring mechanically locked to cleat at 72 inches (1820 mm) on center.
   6. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, corners, intersections, curves, pier caps, and end caps; minimum 14 inch (355 mm) long legs on corner, intersection, and end pieces.

   7. Fasteners: Factory-furnished; electrolytically compatible; minimum pull out resistance of 240 pounds (109 kg) for actual substrate used; no exposed fasteners.

2.7 ACCESSORY MATERIALS

A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
   1. Width: 3-1/2 inches (90 mm), nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.
   2. Thickness: Same as thickness of roof insulation.

PART 3 - INSTALLATION

3.1 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.

C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.

D. Perform work using competent and properly equipped personnel.

E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).

G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
   1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
   2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
   3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.2 EXAMINATION

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.

B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate

before commencing with roofing work.

C. Examine roof substrate to verify that it is properly sloped to drains.

D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

3.3 PREPARATION

A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable insulation to membrane manufacturer.

D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

3.4 VAPOR BARRIER INSTALLATION

A. All deck/deck cover substrates (except metal decks) must be primed prior to application. Use only primer supplied by membrane manufacturer.

B. Expanded Polystyrene, Extruded Polystyrene, Common Polyisocyanurate, Fiberglass, Wood Fiber, Perlite and existing single-ply roofs are not acceptable substrates for SBS bitumen adhesive.

C. Application can be made at ambient temperatures as low as 25 °F (-4 °C) as long as membrane has been stored in a heated area so that it will be between 50 °F (10 °C) and 100 °F (38 °C) at the time of application.

D. Install with minimum 3" (76.2 mm) side laps and 6" (152.4 mm) end laps.

E. Roll in with a 75 lb (34 kg) roller to fully mate each roll to substrate, including all lap areas.

3.5 INSULATION AND COVER BOARD INSTALLATION

A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.

B. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.

C. Lay roof insulation in courses parallel to roof edges.

D. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch (6 mm). Fill gaps greater than 1/4 inch (6 mm) with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch (6 mm).

E. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by Factory Mutual for FM Class specified in PART 2 and membrane manufacturer, whichever is more stringent.

F. Adhesive Attachment: Apply in accordance with membrane manufacturer's instructions and recommendations; "walk-in" individual roof insulation boards to obtain maximum adhesive contact.

3.6 SINGLE-PLY MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.

B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.

C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

D. Install membrane adhered to the substrate, with edge securement as specified.

E. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.

F. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches (1:6) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
   1. Exceptions: Round pipe penetrations less than 18 inches (460 mm) in diameter and square penetrations less than 4 inches (200 mm) square.
   2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

3.7 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
   1. Follow roofing manufacturer's instructions.
   2. Remove protective plastic surface film immediately before installation.
   3. Install water block sealant under the membrane anchorage leg.
   4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.

5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.

C. Scuppers: Set in sealant and secure to structure; flash as recommended by manufacturer.

D. Roofing Expansion Joints: Install as shown on drawings and as recommended by roofing manufacturer.

E. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches (200 mm) high above membrane surface.
   1. Use the longest practical flashing pieces.
   2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
   3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
   4. Provide termination directly to the vertical substrate as shown on roof drawings.

F. Roof Drains:
   1. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
   2. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch (12 to 19 mm) of membrane to extend inside clamping ring past drain bolts.
   3. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
   4. Apply sealant on top of drain bowl where clamping ring seats below the membrane
   5. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.

G. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
   1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
   2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches (50 mm) deep, with at least 1 inch (25 mm) clearance from penetration, sloped to shed water.
   3. Structural Steel Tubing: If corner radii are greater than 1/4 inch (6 mm) and longest side of tube does not exceed 12 inches (305 mm), flash as for pipes; otherwise, provide a standard curb with flashing.
   4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.

3.8 FINISHING AND WALKWAY INSTALLATION

A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.
   1. Use specified walkway pads unless otherwise indicated.

B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1.0 inch (25 mm) and maximum of 3.0 inches (75 mm) from each other to allow for drainage.
   1. If installation of walkway pads over field fabricated splices or within 6 inches (150 mm) of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6 inches (150 mm) on either side.
   2. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

3.9 FIELD QUALITY CONTROL

A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).

B. Perform all corrections necessary for issuance of warranty.

3.10 CLEANING

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.11 PROTECTION

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION

SECTION 07 60 00 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 General Requirements, apply to this Section.

1.2 SUMMARY

A. Description: Provide Flashing and Sheet Metal, as shown and specified per Contract Documents; Including, but not limited to:
   1. Metal through wall and base flashing.
   2. Manufactured reglets with counter flashing
   3. Formed roof-drainage sheet metal fabrications.
   4. Exterior wall flashing and expansion joints.
   5. Gutters
   6. Exposed metal trim and fascia units.
   7. Sheet metal accessories.

1.3 RELATED SECTIONS

A. Section 07 92 00 - Joint Sealants and Caulking

1.4 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.5 SUBMITTALS

A. General: Refer to Division 1 Submittal Procedures.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

C. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled works. Include the following:
   1. Identification of material, thickness, weight, and finish for each item and location in Project.
   2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
   3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
   4. Details of termination points and assemblies, including fixed points.
   5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
   6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counter flashings as applicable.
   7. Details of special conditions.
   8. Details of connections to adjoining work.
   9. Detail formed flashing and trim at a scale of not less than 3 inches per 12 inches.

D. Samples: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.
   1. Sheet Metal flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
   2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
   3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
   4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

E. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

F. Qualification Data: For qualified fabricator.

G. Product Certificates: For each type of coping and roof edge flashing that is FM Approvals approved.

H. Product Test Reports: For each product, for tests performed by a qualified testing agency.

I. Sample warranty

1.6 QUALITY ASSURANCE

A. General: Refer to Division 1 Quality Assurance.

B. References:
   1. General: Refer to Division 1 Reference Standards.
   2. National Roofing Contractors Association (NRCA): Roofing Manual.

3. Sheet Metal and Air Conditioning Contractors National Association (SMACNA): Architectural Sheet Metal Manual.

C. Installer Qualifications: Installer of flashing and sheet metal is a certified installer with a history installing manufacturer's products according to manufacturer's specifications.

D. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical roof eave, including gutter, fascia**,** and through wall flashing approximately 2 feet long, including supporting construction cleats, seams, attachments**,** underpayments**,** and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect/Engineer specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Final Acceptance.

1.7 DELIVERY, STORAGE AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.8 WARRANTY

A. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification Class 1-105. Identify materials with name of fabricator and design approved by FM Approvals.

D. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
   1. Design Pressure: As indicated on Drawings

E. Recycled Content of Steel-Sheet Flashing and Trim: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
   1. Exposed Coil-Coated Finish:
      a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   2. Color: As indicated on contract drawings
   3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
   1. Finish: 2B (bright, cold rolled).
   2. Surface: Smooth, flat.

D. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.
   1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.

2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 structural quality.

2.3 UNDERLAYMENT MATERIALS

A. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.

B. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, non-perforated.

C. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
   3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
      b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
      c. Henry Company; Blueskin PE200 HT.
      d. Metal-Fab Manufacturing, LLC; MetShield.
      e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
      f. Or Engineer's approved equal

D. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
      b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
      c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
   2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
   3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Through-Wall Ribbed Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond. Manufacture through-wall flashing with interlocking counter flashing on exterior face, of same metal as reglet.
   1. Stainless Steel: 0.016 inch thick.
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
         1) Cheney Flashing Company; Cheney Flashing (Dovetail).
         2) Cheney Flashing Company; Cheney Flashing (Sawtooth).
         3) Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
         4) Keystone Flashing Company, Inc.; Keystone Three-Way Interlocking Thruwall Flashing.
         5) Sandell Manufacturing Company, Inc.; Pre-Formed Metal Flashing
         6) Or Engineer’s approved equal

B. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Cheney Flashing Company
      b. Hohmann & Barnard, Inc.
      c. Keystone Flashing Company, Inc.

d. Sandell Manufacturing Company, Inc.
e. Or Engineer’s approved equal

C. Material: Stainless steel, 0.019 inch, Aluminum, 0.024 inch thick
1. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
2. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
4. Accessories:
a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
5. Finish: With manufacturer's standard color coating.

2.2 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form non expansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

H. Do not use graphite pencils to mark metal surfaces.

I. Form sections, per referenced standards, true to shape, accurate in size, square, and free from distortion or defects. Form pieces in single length sheets, not to exceed 10'-0" in length. Hem exposed edges on underside 1/2 inch; miter and seam corners.

J. Seams: Flat lock.

K. Corners: One piece with minimum 18 inch long legs; solder for rigidity, seal with sealant.

L. Cleats: Minimum 2 inches wide, interlockable with sheet.

M. Vertical Faces: Bottom edge formed outward 1/4 inch and hemmed to form drip.

N. Flashing Toe: Extend toe 2 inches over roofing; return and brake edges.

O. Soldering: Solder shop formed metal joints. After soldering, remove flux; wipe and wash solder joints clean. Weather seal joints.

P. Back Painting: Paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

2.3 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.
   1. Gutter Style: Box-Style, See drawings.
   2. Expansion Joints: Built in.
   3. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
      a. Copper: 16 oz./sq. ft.thick
      b. Aluminum: 0.032 inch. thick
      c. Stainless Steel: 0.016 inch thick.
      d. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch thick.
      e. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft thick.
      f. Galvanized Steel: 0.022 inch thick.
      g. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.
      h. Zinc: 0.039 inch thick.

B. Downspouts: Fabricate round downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
   1. Hanger Style: 2 inches wide trips fastened to masonry veneer with (2) two stainless steel masonry expansion bolts. Finish is to match downspout.

2. Finish: powder coat – gray, to match existing.
3. Fabricate from the following materials:
   a. Aluminum: 0.024 inch thick.
   b. Galvanized Steel: 0.022 inch thick.
   c. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Product handling:
   1. Delivery: Schedule delivery of materials at the site at such time as required for proper coordination of the work. Receive materials in manufacturer's unopened packages and bearing manufacturer's label.
   2. Storage: Store materials in a dry and well ventilated place, adequately protected from damage and exposure to the elements.

3.2 PREPARATION

A. Examination: Examine conditions of work in place before beginning work; report defects.

B. Measurements: Take field measurements; report variance between plan and field dimensions.

C. Storage: Stack preformed material to prevent twisting, bending or abrasion; slope to ensure drainage.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
   2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.
6. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints as shown and as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section 07 92 00 "Joint Sealants and Caulking."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder metallic-coated steel and aluminum sheet.
2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
3. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
4. Copper Soldering: Tin edges of uncoated copper sheets using solder for copper.

G. Roof edge flashing / fascia to be installed as per roof panel manufacturer’s recommendations.

H. Underlayment:

1. Apply one (1) layer of felt underlayment over surfaces as shown; lap all edges 6 inches minimum, in direction of slope.
2. Polyethylene Sheet: Install polyethylene sheet with adhesive for anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.
3. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

I. Application:
1. General: Make corners square, surfaces true and straight in planes, and lines accurate to profiles. Fit sheet metal tight in place; secure using concealed fasteners. Apply plastic cement compound between metal flashing and felt flashing. Seal metal joints watertight.
2. Expansion and Contraction: Allow for expansion and contraction over an ambient temperature range up to 150 degrees F; distortions resulting from fastening or expansion and contraction stresses not acceptable.
3. Dissimilar Metals: Isolate with heavy coat of bituminous paint. Coat all sheet metal in contact with roofing felts.

J. Assemblies:
1. Flashing:
   a. General: Install flashing where shown; miter and solder joints at corners. Lap joints in counter flashing at least 6 inches and make watertight with sealing tape. Extend counter flashing down not less than 6 inches.
   b. Exterior Metal Frame Flashing: Provide at frame heads, as shown
2. Roof Drainage:
   a. Hanging Gutters: Install with a minimum pitch of 1/16” per foot, pitch towards gutters, with joints and closed ends riveted and soldered; provide expansion joints as required. Secure with sheet metal straps.
   b. Interior Gutter: Install with a minimum pitch of 1/16” per foot, pitch as shown on drawings, with joints and closed ends riveted and soldered; provide expansion joints as required. Secure with sheet metal straps.
   c. Rainwater Leaders
      1) Downspouts: Connect to gutter as shown. Fasten to column with metal straps located at the top, center point and bottom of each downspout; align straps on column face; maximum spacing 6'-0".

K. Sealants: As shown; per manufacturer's directions.

L. Galvanizing Repair Treatment: Repair damaged zinc coating with specified repair compound, as required.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
   1. Anchor and loosely lock back edge of gutter to continuous cleat
   2. Coordinate installation with roof panel manufacturer.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
   1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c. in between.
   2. Provide elbows at base of downspout to direct water away from building.
   3. Connect downspouts to underground drainage system indicated.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated.
   1. Brick Headwall: Sawcut reglet joint at existing mortar joints at minimum recommended height above roof plane. Full continuous seal at reglet joint.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 63 10 - GUTTERS & DOWNSPOUTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Aluminum gutters
   2. PVC leaders

B. Related Sections:
   1. Section 07 53 23 – EPDM Roofing
   2. Section 07 92 00 - Joint Sealants and Caulking

1.3 REFERENCE DOCUMENTS

A. NSF/ANSI 14 – Plastic Piping System Components and Related Materials

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.
   1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
   2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
   3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
   4. Detail termination points and assemblies, including fixed points.
   5. Include details of special conditions.

C. Samples: For each type of roof specialty and for each color and texture specified.

D. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of roof specialty.

C. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Material shall be certified by NSF International as complying with NSF 14, and ASTM F 2389 or CSA B137.11.

B. Material shall comply with manufacturers specifications.

C. Special Engineered products shall be certified by NSF International as complying with NSF 14.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Gutters: Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

B. Warranty shall cover labor and material costs of repairing and/or replacing defective materials and repairing any incidental damage caused by failure of the piping system due to defects in materials or manufacturing.

C. Warranty shall be in effect only upon submission by the contractor to the manufacturer valid pressure/leak test documentation indicating that the system was tested and passed the manufacturer's pressure/leak test.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Differential values in "Temperature Change (Range)" Subparagraph below (for aluminum in particular) are suitable for most of the United States.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

2.2 GUTTERS

A. Manufacturer:
   1. ATAS International
   2. Architectural Products Company
   3. Berger Building Products
   4. Or approved equal

B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.

1. Aluminum Sheet: 0.032 inch, heavy gauge
2. Gutter Profile: Style A according to SMACNA's "Architectural Sheet Metal Manual."
3. Size: 5”x5”
4. Corners: Factory mitered and mechanically clinched and sealed watertight.
5. Gutter Supports: Gutter brackets & Straps with finish matching the gutters.

C. Aluminum Finish: Two-coat fluoropolymer
   1. Color: MNR Green (Carboline P337)

D. Material - Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

2.3 PVC DOWNSPOUTS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain.

B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 80.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain to fit Schedule 80 pipe.

D. Adhesive Primer: ASTM F 656.
   1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Solvent Cement: ASTM D 2564.
   1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. UV Protection
   1. Paint per specification 09 91 00 Painting
      a. Color: MNR Green (Carboline P337)

2.4 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: ASTM D 1970/D 1970M; stable after testing at 240 deg F
   2. Low-Temperature Flexibility: ASTM D 1970/D 1970M; passes after testing at minus 20 deg F

2.5 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
   1. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.

B. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Coil-Coated Aluminum Sheet Finishes:
   1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      b. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayment, sealants, and other miscellaneous items as required to complete roof-specialty systems.
   1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
   2. Provide uniform, neat seams with minimum exposure of solder and sealant.
   3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
   4. Torch cutting of roof specialties is not permitted.
   5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
   1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
   2. When ambient temperature at time of installation is between 40 and 70 deg F set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

E. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F

3.4 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 12 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
   1. Provide elbows at base of downspouts at grade to direct water away from building.
   2. Connect downspouts to underground drainage system indicated.

3.5 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and other design considerations. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping at indicated slopes.

C. Install piping free of sags and bends.

D. Install fittings for changes in direction and branch connections.

E. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

F. Install storm drainage piping at the following minimum slopes unless otherwise indicated:
   1. Building Storm Drain: 1 percent downward in direction of flow for piping
   2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

G. Install aboveground PVC piping according to ASTM D 2665.

H. Install hangers and supports at intervals specified in the applicable Plumbing or Mechanical Code and/or as recommended by pipe manufacturer.

I. Support vertical piping at each floor and as specified in the applicable Plumbing or Mechanical Code. For piping sized two inches or less provide a mid-story guide.

J. If heat tracing is specified for the piping, it should be installed on the pipe interior or exterior. It must be suitable for use with plastic piping and self-regulating to ensure the surface temperature of the pipe and fittings will not exceed 70°C.

K. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.

L. Connect downspouts to underground drainage system indicated

3.6 JOINT CONSTRUCTION

A. Plastic, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.7 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

E. The pipes should be flushed with cold water after finishing the installation. Inspect and test piping systems following procedures of authorities having jurisdiction and as specified by the piping system manufacturer.

END OF SECTION

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 1 General Requirements

B. Section 07 53 23 EPDM Roofing

C. Section 08 90 00 Louvers and Vents

1.2 SUMMARY

A. Requirements for roof vents, penetrations, and accessories.

1.3 REFERENCES

A. Building Code of New York State

B. Energy Conservation Construction Code of New York State

C. New York State Fire Prevention Code

1.4 QUALITY ASSURANCE

A. Products shall be provided by a firm specializing in the fabrication of the roof accessories indicated.

B. All roof accessories must be compatible with the roofing system specified, such that accessories will not void the warranty of the roofing system.

1.5 SUBMITTALS

A. Shop drawings for the fabrication and installation of custom fabricated roof accessory units. Show jointing, anchorage, accessory items and shop finishes. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other Work.

B. Manufacturer's or fabricator's standard drawings and installation instructions for each roof accessory.

C. Certification of fire-resistance ratings as required for the various assemblies.

D. Product Data: For each type of product indicated. Include construction details, materials, dimensions of individual components and profiles, and finishes.

E. Coordination Drawings: Roof plans drawn to scale and coordinating penetrations and roof-mounted items. Show the following:
   1. Size and location of roof accessories specified in this Section.
   2. Method of attaching roof accessories to roof or building structure.
   3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.

F. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for roof accessories with factory-applied color finishes.

G. Samples for Verification: For each type of exposed finish required, prepared on Samples in manufacturer's standard sizes, and of same thickness and material indicated for the Work. If finishes involve normal color or shade variations, include sample sets showing the full range of variations expected.

H. All submittals are to be in accordance with Division 01 – Submittal Procedures.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
   1. Schedule delivery of materials at the site at such time as required for proper coordination of the work. Receive materials in manufacture's unopened packages and bearing manufacturer's label.

B. Storage and Handling:
   1. Store materials in a dry and well ventilated place, adequately protected from damage and exposure to the elements.

PART 2 - PRODUCTS

2.1 ROOF CURBS

A. General: Provide roof curbs capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
   1. Top of roof curbs must be level for equipment installation, regardless of the slope of the roof plane on which the curb will be located; curb must provide a level surface for equipment installation.

B. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 18 ga. Galvanized steel with welded and mitered corner joints.
   1. Provide preservative-treated wood nailers at tops of curbs and formed flange at perimeter bottom for mounting to roof.
   2. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
   3. Provide manufacturer's standard rigid or semi-rigid insulation where indicated.
   4. Provide formed cants and base profile coordinated with roof insulation thickness.
   5. Fabricate units to minimum height of 10 inches above finished roof, unless otherwise indicated.
   6. Units shall be factory insulated 1-1/2" thick minimum three pound density fiberglass insulation.

2.2 EQUIPMENT SUPPORTS

A. General: Provide equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

B. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 0.063-inch (1.6-mm-) thick, sheet aluminum with welded corner joints.
   1. Provide preservative-treated wood nailers at tops of curbs and formed flange at perimeter bottom for mounting to roof.
   2. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
   3. Fabricate units to minimum height of 8 inches (200 mm), unless otherwise indicated.
   4. Sloping Roofs: Where slope of roof deck exceeds ¼ inch per foot (1:48), fabricate support units with height tapered to match sloe to level tops ofunits.

2.3 ALUMINUM FINISHES

A. Finish designations prefixed by AA Comply with the system established by the Aluminum Association for designing aluminum finishes.

B. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating: Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's specifications for cleaning, conversion coating, and painting.
   1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 603.8 except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss.
   2. Color: As selected by Engineer from manufacturer's full range of custom colors.

PART 3 - EXECUTION

3.1 PREPARATION

A. Transmit submittals for all products listed in this section.

B. Furnish products as indicated.

C. Ensure that substrates are in suitable condition to receive the work.

3.2 INSTALLATION

A. Install roof accessory in accordance with the manufacturer's instructions. Set each unit level and plumb, true to line. Anchor accessories securely to the substrate.

B. Set flanges of units in roofing mastic, and leave surfaces smooth and clean for application of metal roofing and flashing. Provide manufacturer's recommended method for watertight attachment to pre-finished metal roofing.

3.3 INSTALLATION ROOF CURBS / EQUIPMENT SUPPORTS

A. General: Comply with manufacturer's written instructions. Coordinate installation of roof accessories with installation of roof deck, roof insulation, flashing, roofing membranes, penetrations, equipment, and other construction involving roof accessories to ensure that each element of the Work performs properly and that combined elements are waterproof and weather tight. Anchor roof accessories securely to supporting structural substrates so they are capable of withstanding lateral and thermal stresses, and inward and outward loading pressures.

B. Install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated.

C. Separation: Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.

D. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

E. Cap Flashing: Where required as component of accessory, install cap flashing to provide waterproof overlap with roofing or roof flashing (as counter flashing). Seal overlap with thick bead of mastic sealant.

F. Ridge Vents: Install according to manufacturer's written instructions.

3.4 CLEANING AND PROTECTION

A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION

SECTION 07 81 00 - APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Material Certificates: For each type and size of the following:
   1. Masonry units.
      a. Include data on material properties

1.2 GENERAL

A. RELATED DOCUMENTS

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

A. Section includes sprayed fire-resistive materials (SFRM).

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site
   1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Framing plans, schedules, or both, indicating the following:
   1. Extent of fireproofing for each construction and fire-resistance rating.
   2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
   3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
   4. Treatment of fireproofing after application.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions in size.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Product Certificates: For each type of fireproofing.

C. Evaluation Reports: For fireproofing, from ICC-ES.

D. Preconstruction Test Reports: For fireproofing.

E. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

B. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.
   1. Build mockup of each type of fireproofing and different substrate as shown on Drawings.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on field mockups of fireproofing.
   1. Provide test specimens and assemblies representative of proposed materials and construction.

B. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.
   1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
   2. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
   3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
   4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Source Limitations: Obtain fireproofing from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Steel members are to be considered unrestrained unless specifically noted otherwise.

D. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction.
1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.
4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.

E. Low-Emitting Materials: Fireproofing used within the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

A. SFRM: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application.
1. Manufacturer:
   a. Carboline
   b. GCP Applied Technologies
   c. Isolatek International
   d. Or approved Equal

2. Application: Designated for exterior use by a qualified testing agency acceptable to authorities having jurisdiction.
3. Bond Strength: Minimum 150-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E 736.
4. Density: Not less than [15 lb/cu. ft. and as specified in the approved fire-resistance design, according to ASTM E 605.
5. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch.
6. Combustion Characteristics: ASTM E 136.
7. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 10 or less.
   b. Smoke-Developed Index: 10 or less.
8. Compressive Strength: Minimum 10 lbf/sq. in. according to ASTM E 761.
9. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
10. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
11. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
12. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours according to ASTM E 859.
13. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in [no growth on specimens per ASTM G 21] [or] [rating of 10 according to ASTM D 3274 when tested according to ASTM D 3273].
14. Finish: Spray-textured finish
    a. Color(of Topcoat): As selected by Architect from manufacturer's full range

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
   1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
   2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.

C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.

D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written

recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.

E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.

F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.

G. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by fireproofing manufacturer for each fire-resistance design.
   1. Manufacturer:
      a. Carboline
      b. GCP Applied Technologies
      c. Isolatek International
      d. Or approved Equal

H. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.
   1. Cement-Based Topcoat: Factory-mixed, cementitious hard-coat formulation for trowel or spray application over SFRM.
   2. Manufacturer:
      a. Carboline
      b. GCP Applied Technologies
      c. Isolatek International
      d. Or approved Equal

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:
   1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
   2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
   3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.

B. Verify that concrete work on steel deck has been completed before beginning fireproofing work.

C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work is complete before beginning fireproofing work.

D. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.

B. Clean substrates of substances that could impair bond of fireproofing.

C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
   1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
   2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.

D. Metal Decks:
   1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, has been completed.

2. Do not apply fireproofing to underside of metal roof deck until roofing has been completed; prohibit roof traffic during application and drying of fireproofing.

E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

F. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

G. Extend fireproofing in full thickness over entire area of each substrate to be protected.

H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.

I. For applications over encapsulated materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulated over which it is applied.

J. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.

K. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.

L. Cure fireproofing according to fireproofing manufacturer's written recommendations.

M. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

N. Finishes: Where indicated, apply fireproofing to produce the following finishes:
1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.
4. Skip-Troweled Finish: Even leveled surface produced by troweling spray-applied finish to smooth out the texture and neaten edges.
5. Skip-Troweled Finish with Corner Beads: Even, leveled surface produced by troweling spray-applied finish to smooth out the texture, eliminate surface markings, and square off edges.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
1. Test and inspect as required by the IBC, 1704.10.

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fireproofing will be considered defective if it does not pass tests and inspections.
   1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
   2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.

C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.

D. Repair fireproofing damaged by other work before concealing it with other construction.

E. Repair fireproofing by reapplying it using same method as original installation or using manufacturers recommended trowel-applied product.

END OF SECTION

SECTION 07 84 0 - FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing firestopping in accordance to those indicated for this Project.
   1. Record of successful in-service performance.

B. Installer Qualifications: Competent and experienced firm capable of installing firestopping to attain designed operational performance.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:
   1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
   3. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
      a. UL in its "Fire Resistance Directory."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
   1. Manufacturer
      a. Hilti
      b. Tremco
      c. 3M Fire protection Products
      d. Or approved equal

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.

D. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content:
   1. Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

E. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
   1. Permanent forming/damming/backing materials.
   2. Substrate primers.

2.3 FILL MATERIALS

A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

C. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

D. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

E. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

F. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant

additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

G. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

H. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
   1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Final Acceptance. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.6 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Penetration Firestopping Systems with No Penetrating Items:
   1. UL-Classified Systems: W-L-0001-0999, F-B-0001-0999

C. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing:
   1. UL-Classified Systems: W-L-1001-1999, F-B-1001-1999.

D. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing:
   1. UL-Classified Systems: W-L-2001-2999, F-B-2001-2999

E. Penetration Firestopping Systems for Miscellaneous Mechanical Penetrants:
   1. UL-Classified Systems: W-L-7000-7999, F-B-7000-7999

F. Penetration Firestopping Systems for Groupings of Penetrants:
   1. UL-Classified Systems: W-L-8001-8999

PART 4 - END OF SECTION

SECTION 07 91 00 - PREFORMED JOINT SEALS

PART 1 - GENERAL

1.1 SUMMARY

A. The work shall consist of furnishing and installing waterproof expansion joints in accordance with the details shown on the plans and the requirements of the specifications. Preformed sealant shall be silicone pre-coated, preformed, pre-compressed, self-expanding, sealant system.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete

B. Section 07 19 00 – Lithium Silicate Sealer

C. Section 07 92 00 - Joint Sealant and Caulking

1.3 SUBMITTALS

A. General – Submit the following according to Division 1 Specification Section.

B. Standard Submittal Package – Submit typical expansion joint drawing(s) indicating pertinent dimensions, general construction, expansion joint opening dimensions and product information.

C. Sample of material.

D. All products must be certified by an independent laboratory test report to be free in composition of any waxes or wax compounds, using FTIR and DSC testing.

E. All products shall be certified in writing to be: a) capable of withstanding 150°F (65°C) for 3 hours while compressed down to the minimum of movement of the product (-25% of nominal material size) without evidence of any bleeding of impregnation medium from the material; and b) that the same material after the heat stability test and after first being cooled to room temperature will subsequently self-expand to the maximum dimension of the product (+30% of nominal material size) within 24 hours at room temperature 68°F (20°C).

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in Manufacturer’s original, intact, labeled containers. Handle and protect as necessary to prevent damage or deterioration during shipment, handling and storage. Store in accordance with manufacturer’s installation instructions.

1.5 QUALITY ASSURANCE

A. The General Contractor will conduct a pre-construction meeting with all parties and trades involved in the treatment of work at and around expansion joints. All superintendents and foremen with responsibility for oversight and setting of the joint gap must attend this meeting. The General Contractor is responsible to coordinate and schedule all trades and ensure that all subcontractors understand their responsibilities in relation to expansion joints and that their work cannot impede anticipated structural movement at the expansion joints, or compromise the achievement of watertightness or life safety at expansion joints in any way.

B. Warranty – Manufacturer's standard warranty shall apply.

C. LEED Building Performance Requirements: The VOC of the silicone must not exceed 50 grams/liter.

PART 2 - PRODUCT

2.1 GENERAL

A. All joints shall be "DSM System" as manufactured by: (USA & International) EMSEAL JOINT SYSTEMS, LTD 25 Bridle Lane, Westborough, MA 01581-2603, Toll Free: 800-526-8365. (Canada) EMSEAL, LLC 120 Carrier Drive, Toronto, Ontario, Canada M9W 5R1 Toll Free: 800-526-8365. www.emseal.com, or engineer's approved equal.

B. Alternate manufacturers must demonstrate that their products meet or exceed the design criteria, be "high heel proof", and must submit certified performance test reports performed by nationally recognized independent laboratories as called for in the Submittals specification subsection. Submittal of alternates must be submitted for the engineer's review and approval prior to fabrication, procurement or installation.

C. Provide traffic durable, watertight, expansion joints and isolation joints in concrete decks. Typical locations include, but are not limited to the following: applications for platform joints, stair tower perimeters, elevator perimeters, and structural expansion joints. System shall perform waterproofing, traffic bearing and movement-accommodation functions as the result of a single installation and without the addition of gutters, vapor barriers, bladders, or other devices suspended beneath or within the system in any way.

D. Sealant system shall be comprised of three components: 1) cellular polyurethane foam impregnated with hydrophobic 100% acrylic, water-based emulsion, factory coated with highway-grade, fuel resistant silicone; 2) field-applied epoxy adhesive primer, 3) field-injected silicone sealant bands.

E. Material shall be capable as of movements of +30%, -25% (55% total) of nominal material size. Standard sizes from 1/2" (12mm) to 4" (150mm). Depth of seal as recommended by manufacturer.

F. Silicone coating to be highway-grade, low-modulus, jet-fuel resistant silicone applied to the impregnated foam sealant at a width greater than maximum allowable joint extension and which when cured and compressed will form a bellows.

G. Joint to be installed into manufacturer's standard field-applied epoxy adhesive.

H. Joint is to be installed slightly recessed from the surface such that when the field-applied injection band of silicone is installed between the substrates and the foam-and-silicone-bellows, the system will be essentially flush with the substrate surface.

I. Select the sealant system model appropriate to the movement and design requirements at each joint location that meet the project specification or as defined by the structural engineer of record.

J. Manufacturer's Checklist must be completed by expansion joint subcontractor and returned to manufacturer at time of ordering material.

2.2 FABRICATION

A. Joint must be supplied precompressed to less than the joint size, packaged in shrink-wrapped lengths (sticks).

B. Directional changes and terminations into horizontal plane surfaces to be provided by factory-manufactured universal-90-degree single units containing minimum 12-inch long leg and 6-inch long leg or custom leg on each side of the direction change or through field fabrication in strict accordance with installation instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that:
   1. Joints are clean, dry, sound, smooth, straight and parallel, and otherwise ready to receive joint seals.
   2. Joint seals are of the correct width to provide specified compression.
   3. Joints are of sufficient depth.

B. Do not proceed with installation until detrimental conditions have been corrected.

3.2 INSTALLATION

A. Install joint seals in accordance with manufacturer's instructions.

B. Do not install joint seals when temperature is below 0 degrees F (-17 degrees C) or above 95 degrees F (35 degrees C). Do not install joint seals in rain or snow.

C. Do not use scrap material.

D. Preparation of the Work Area
   1. The contractor shall provide properly formed and prepared expansion joint openings constructed to the exact dimensions of the existing joint openings at 68 Degrees F. Deviations from these dimensions will not be allowed without the written consent of the engineer of record.
   2. The contractor shall clean the joint opening of all contaminants immediately prior to installation of expansion joint system. Repair spalled, irregular or unsound joint surfaces using accepted industry practices for repair of the substrates in question. Remove protruding roughness to ensure joint sides are smooth. Ensure that there is sufficient depth to receive the full depth of the size of the joint being installed. Refer to Manufacturers Installation Guide for detailed step-by-step instructions.
   3. No drilling, or screwing, or fasteners of any type are permitted to anchor the sealant system into the substrate.
   4. System to be installed by qualified sub-contractors only according to detailed published installation procedures and/or in accordance with job-specific installation instructions of manufacturer's field technician.
   5. CLEAN AND PROTECT

E. Protect the system and its components during construction. Subsequent damage to the expansion joint system will be repaired at the general contractor's expense. After work is complete, clean exposed surfaces with a suitable cleaner that will not harm or attack the finish.

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS AND CAULKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 General Requirements, apply to this Section.

1.2 SUMMARY

A. Description: This Section includes but is not limited to sealants for the following applications:
   1. Exterior joints in the following vertical surfaces and non-traffic horizontal surfaces:
      a. Joints between different materials to prevent infiltration of weather elements.
      b. Perimeter joints between frames of doors and windows.
      c. Control and expansion joints in sheet metal work, ceilings and overhead surfaces.
      d. Other joints as indicated or otherwise required to complete the Work of this Section and the Work of other Sections.
   2. Interior joints in the following vertical surfaces and horizontal non-traffic surfaces:
      a. Perimeter joints of exterior openings where indicated.
      b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
      c. Other joints as indicated or otherwise required to complete the Work of this Section and the Work of other Sections.
   3. Primers: Applications of manufacturers' recommended primers or system component Primers to joint surfaces prior to sealant installation.

1.3 RELATED SECTIONS

A. Section 07 60 00 - Flashing and Sheet Metal

B. Section 08 11 00 – Doors and Frames

C. Section 08 51 13 – Aluminum Windows

D. Section 08 80 00 – Glazing

1.4 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and air tight continuous joint seals without staining or deteriorating joint substrates.

1.5 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Product Certificates: Signed by manufacturers of joint sealants certifying that products furnished comply with requirements and are suitable for the use indicated.

D. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Compatibility and Adhesion Test Reports: From sealant manufacturer indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Warranties: warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer of joint sealants and caulking is a certified installer with documented history installing manufacturer’s products according to manufacturer’s specifications.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
   2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
   3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
   4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

D. Mockups: Provide a full-scale field mock-up of each type sealant application indicated, consisting of a minimum of 10 linear feet of installed primer and sealant, and indicating the proposed installation methods and proposed finished conditions of each material, component and system required. Install individual components complete, and in the sequence required, in full accordance

with Manufacturer's written instructions (where applicable), and in compliance with requirements of Contract Documents.

1. Preparation: Notify Engineer of intention to install mock-ups required and obtain Engineer's acceptance for proposed mock-up locations. Install mock-ups in place within the Work unless other locations are requested by Engineer.
2. Where Engineer requests an opportunity to view the installations in progress, notify Engineer of exact schedule of mock-up installations, at least 24-48 hours in advance.
3. Reinstall or revise mock-ups where requested by Engineer until satisfactory results and Engineer's acceptance are obtained.
4. Provide precise and consistent match to accepted mock-ups in subsequent work. Where requested by Engineer, remove non-matching work and replace with new work.
5. Protect accepted mock-ups until completion of Project Work. Accepted mock-ups may remain as part of the finished Work only at the discretion of the Engineer.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40° F.
3. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.9 WARRANTY

A. General Warranty: warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to,

and run concurrent with, other warranties made by contractor under requirements of the Contract Documents.

B. Installer's Warranty: Written warranty, signed by Installer agreeing to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Final Acceptance.

C. Standard Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: 20 years from date of Final Acceptance.

D. Warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
   1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include products of the following manufacturers:
   1. Tremco
   2. Dow Corning Corporation
   3. Pecora
   4. GE Silicon
   5. Or Engineer’s approved equal

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Fire rated assemblies: Verify with the manufacturer for the appropriate sealant and caulking.

C. Colors of Exposed Joint Sealants: As selected by Engineer/Architect from manufacturer's full range.

2.3 SEALANT MATERIALS

A. For purposes of establishing the standard of quality for sealants and related materials, the following specifications are based on products listed. Equivalent products from the acceptable manufacturers listed will be considered for use in this Project, subject to the approval of the Engineer.

2.4 SINGLE-PART URETHANE SEALANT (Sealant No. 1)

A. Polyurethane Sealant: Single component, chemical during, non-staining, non-bleeding, capable of continuous water immersion, non-sagging, self-leveling type; complying with Class A ASTM C 920, Type S, Grade NS, Class 25, Use NT, M, A, O.

B. Products: Subject to compliance with requirements, provide the following:
   1. Low Modulus Expansion Joint Sealant: Dymonic, product of Tremco or Engineer's approved equal

2.5 SINGLE-PART SILICONE SEALANTS (Sealant No. 2)

A. Silicone Sealant: Single component, neutral-cure, solvent curing, cold-applied, non-sagging, non-staining, fungus resistant, non-bleeding; complying with ASTM C 920, Type S, NS, Class 25.

B. Products: Subject to compliance with requirements, provide one of the following:
   1. Silicone Sealant:
      a. Dow 795 Silicone Building Sealant, product of Dow Corning Corporation.
      b. Silpruf Silicone Sealant, product of GE Silicones.
      c. Pecora 864 Silicone Sealant, product of Pecora.
      d. Or Engineer's approved equal

2.6 ACRYLIC LATEX SEALANT (Sealant No. 3)

A. Sealant for interior joints, exposed or paint-finished: Tremco Acrylic Latex sealant manufactured by the Tremco Manufacturing Company or Engineer's Approved Equal meeting the requirements of ASTM C-834.

2.7 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
   1. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
   2. Type O: Open-cell material.

B. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26° F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.8 PRIMERS AND MISCELLANEOUS MATERIALS

A. Primers: Materials recommended by joint sealant manufacturer for advancing or improving adhesion of sealant to joint substrates indicated, as determined from pre-construction joint-sealant-substrate tests and field tests.

B. Primer Use Required: Primer use is required throughout each application, unless unacceptable staining of adjacent materials results.
   1. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.
   2. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable

of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates as recommended in writing by joint sealant manufacturer, based on pre-construction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
   1. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
   2. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
   3. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
      a. Do not leave gaps between ends of sealant backings.
      b. Do not stretch, twist, puncture, or tear sealant backings.
      c. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
   4. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.
   5. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
      a. Place sealants so they directly contact and fully wet joint substrates.
      b. Completely fill recesses provided for each joint configuration.
      c. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

6. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   a. Remove excess sealants from surfaces adjacent to joint.
   b. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   c. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
   d. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.
   e. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Final Acceptance. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

3.6 MISCELLANEOUS SEALANT WORK AND REPAIRS

A. Examine existing sealant work to remain and new and existing sealant and other work at platform. Provide such additional sealant applications and installations as may be required to repair existing work, to restore the weather-impermeability of existing and new work, and to complete the work of other Sections.

3.7 SEALANT SCHEDULE

A. Interior and exterior joints requiring sealant work include, but are not limited to, the following:
   1. Metal/metal joints: Sealant No. 2.
   2. Masonry joints: Sealant No. 1.
   3. Concrete joints: Sealant No. 1.
   4. Glass/metal joints: Sealant No. 2.
   5. Metal/concrete: Sealant No. 1.
   6. Metal/wood joints: Sealant No. 3.

END OF SECTION

SECTION 08 11 00 - DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements for standard steel doors and frames at Scarsdale and Hartsdale Stations.

1.2 Related Sections

1. Section 07 92 00 Joint Sealants and Caulking
2. Section 09 90 10 Painting and Finishing
3. Section 09 91 14 Preparation of Surfaces
4. Section 08 70 00 Hardware

1.3 REFERENCES

A. American National Standards Institute (ANSI):
   1. A115 Specifications for Steel Door and Frame Preparation for Hardware (A115.1-A115.17)
   2. A224.1 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames

B. American Society for Testing and Materials (ASTM):
   1. A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   2. C236 Test Method for Steady State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box
   3. C976 Test Method for Thermal Performance of Building Assemblies by Means of a Calibrated Hot Box
   4. E152 Fire Tests of Door Assemblies

C. Door and Hardware Institute (DHI):
   1. Recommended Locations for Builders Hardware on Standard Steel Doors and Frames

D. National Fire Protection Association (NFPA):
   1. 80 Fire Doors and Windows

E. Steel Door Institute (SDI):
   1. 100 Recommended Specifications for Standard Steel Doors and Frames
      a. 105 Recommended Erection Instructions for Steel Frames
      b. 112 Galvanized Standard Steel Doors and Frames
      c. 117 Manufacturing Tolerances Standard Steel Doors and Frames

F. Underwriters Laboratories Inc. (UL):
   1. Building Materials Directory

1.4 QUALITY ASSURANCE

A. Applicable Standards: Specifications and standards of SDI 100-98.

B. Wind Load Performance Requirements: Comply with wind load requirements of Uniform Building Code. Deflection shall not exceed 1/175 of span.

C. Supplier Qualification: Qualified direct distributor of products to be furnished. The distributor shall have in their regular employment an A.H.C./C.D.C. or person of equivalent experience who will be available at reasonable timesto consult with the Engineer, Design Builder and/or Owner regarding any matters affecting the total door and frame openings.

D. Installer Qualification: Experience with installation of similar materials.

1.5 SUBMITTALS

A. Product data for each type of door and frame specified.

B. Shop drawings including details of each frame type, elevations of door design types, and schedule of doors and frames.

C. Manufacturer's certifications for labeled construction.

D. All submittals are to be in accordance with Division 01 – SubmittalProcedures.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
1. Schedule delivery of materials at the site at such time as required for proper coordination of the work. Receive materials in manufacture’s unopened packages and bearing manufacturer’s label.

B. Storage and Handling:
1. Store materials in a dry and well-ventilated place, adequately protected from damage and exposure to the elements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products of the following:

B. Manufacturer of Steel Doors and Frames:
1. Steelcraft
2. Cornell Ironworks
3. Curries
4. Ceco

5. Or approved equal.

2.2 DOORS

A. Exterior: Seamless, Grade III, Model 1, minimum 16 gage, in accordance with SDI 100, galvanized steel faces in accordance with SDI 112.

B. Internal Construction: Manufacturer's standard with internal sound deadener.

C. Provide to design indicated including: Flush panel doors, flush panel with cut- out as indicated, stile and rail type, stile and rail with door louver. Use galvanized steel at exterior doors.

D. Exterior Doors (and Interior Reinforced Doors): 20 gauge steel stiffener reinforced vertically 6 inches o.c. full height and width, spot welded 5 inches o.c. to both face sheets. Stiffeners welded together top and bottom. Insulate with 2 lb minimum density mineral wool insulation.

E. Composite Core Interior Doors (Typical): Polystyrene core permanently laminated to inside face sheets.

F. Door Construction: Manufacturer's standard polystyrene, polyurethane foamed in place, vertical steel stiffeners, or rigid mineral fiber core with internal sound deadener on inside of face sheets where appropriate in accordance with SDI standards.

G. Labeled Doors: Insulate as required by Underwriters Laboratories. Build in special hardware and provide astragals as indicated. At one hour and at 1-1/2 hour doors at enclosures, maximum transmitted temperature end point shall not exceed 450 degrees F above ambient at end of 30 minutes of fire exposure per U.L.

H. Seamless Vertical Edges: Construct doors with smooth flush surfaces, without visible joints or seams on exposed faces or stile edges. Interior and exterior door edge seams shall be full height wire welded and ground smooth.

I. Exterior Metal Door Louvers: Fabricate louver units of 16-gauge galvanized steel sheets with stationary, weatherproof Z-shaped blades and U-shaped frames, not less than 1-3/8 inch thick. Space louver blades not more than 1- 1/2 inch o.c. Assemble units by welding. Provide insect screen on interior side of frame, consisting of 14 by 18 wire mesh in rigid, formed metal frame.

J. Interior Hollow Metal Door Louvers: Fabricate of 20-gauge cold-rolled steel sheets with stationary sight proof inverted V-shaped blades and U-shaped frames. Space louver blades not more than 3 inches o.c. Assemble units by welding.

K. Typical Reinforcement: Provide as required for hardware items. For lock reinforcement, provide manufacturer's standard reinforcement. Provide 12 gauge reinforcement for escutcheons or roses. centering clips to hold lock case in alignment. For door checks, provide 3/16 inch channel type reinforcements, 3-1/2 inch deep by 14 inches long, or as required. Hinge reinforcement minimum 7 gauge by 1-1/2 inch by 9 inch bar. Weld reinforcing to door. Reinforce doors for surface items such as surface and semi- concealed closers, brackets, surface holders and door stops. Drilling and tapping installation of these surface items shall be done in field by hardware installer.

L. Special Reinforcing: At exterior doors, reinforce inside of door on hinge side with high frequency hinge preparation. Weld to door.

M. Hardware: Mortise, reinforce, drill and tap for hardware furnished under Section 08 70 00 - Hardware, except drilling and tapping for surface door closers, door closer brackets and adjusters shall be done in field. Obtain templates from hardware supplier.

N. Finish: Provide prime coat finish on doors. Thoroughly clean off rust, grease and other impurities. Grind welds smooth, no marks shall show. Apply metallic filler as required to fill cracks and joints and to level any weld areas or similar imperfections. Sand filler coat smooth.

2.3 FRAMES

A. General: Form to profiles indicated. Where necessary, alternate details will be considered provided design intent is maintained. Consider and provide for erection methods.

B. Typical Reinforcing: Provide minimum hinge reinforcement 3/16 inch by 1-1/2 inch by 10 inch. Provide similar reinforcement for hardware items as required to adequately withstand stresses, minimum 12 gauge, including channel reinforcement for door closers and closer arms, door holders and similar items. Provide reinforcement and clearances for concealed in-head door closers and for mortise locks.

C. Cover Plates: For hinge and strike plate cutouts, provide fully enclosed pressed steel cover boxes spot welded to frames behind mortises.

D. Hardware: Mortise, reinforce, drill and tap for mortise hardware, except drilling and tapping for surface door closers, door closer brackets and adjusters shall be done in field.

E. Anchorage: Provide standard and special anchorage items as required. Provide formed steel channel spreader at bottom of frames, removable without damaging frame. At masonry, provide anchors (about 2 inch by 10 inch) approximately 24 inches on center.

F. Extensions: Reinforce transom bars or mullions as necessary to provide rigid installation. Where required (as at multiple openings) to stabilize large frames, provide frame or mullion extensions to anchor to structure above, proper size to fit within overhead construction. Provide angle clips to fasten to structure.

G. Mullions: Provide mullions, straight and without twist, of tubular design. For removable mullions provide reinforcing at frame head.

H. Clearances: Provide and be responsible for proper clearances at metal frames, including for weather stripping, sound stripping and smoke gasketing. Glass clearance shall be thickness of glass plus clearance each side (1/8 inch minimum exterior - 1/16 inch minimum interior), adjust for installation, glass thickness to allow for glazing and sealant. Where sealed double glazing is indicated, provide rebates minimum of 3/4 inch and provide 1/4 inch clearance at glass edges. Where units fit around concrete blocks (blocks built into frames) obtain actual dimensions of blocks being used to establish minimum clearances.

I. Labeled Frames: Construct in accordance with requirements for labeled work. Attach proper U.L. label, Warnok Hersey. "B" labeled frames shall be 1-1/2 hour construction.

J. Joinings: At frames with equal width jambs and head, neatly miter on face (except locations as at transom bars and at frames with large head members). Cope and butt stops. Weld length of entire joint, including face and flat intersections. Grind smooth, at other frames, provide same mitered joint wherever possible (at intersection of jamb-head or jamb-sill) and at other locations butt metal neatly and full weld. If tight butt joints are utilized, joints shall be neatly caulked smooth.

K. Workmanship: Fabricate so no grind marks, hollow or other out-of-plane areas are visible. At joints of intermediate members (such as mullions and transom bars), provide tight joining, neatly accomplished without holes, burned out spots, weld build up or other defacing work. Fill to close cracks and to preserve shapes. Tightly fit loose stops, to hairline joints.

L. Finish: Clean frames by degreasing process and apply thorough coating of baked-on primer, covering inside as well as outside surfaces. At galvanized frames, coat welds and other disrupted surface with zinc-rich paint containing not less than 90 percent zinc dust by weight.

2.4 FASTENINGS

A. Provide fastenings, anchors and clips as required to secure hollow metal work in place. Provide Jackson head screws, or flatter. Dimple metal work to receive screw heads. Set stops and other non-structural fastenings with #6 Jackson head self-tapping screws.

2.5 MISCELLANEOUS

A. Supports and Anchors: Minimum 18 gage sheet steel; galvanized where used with galvanized frames.

B. Inserts, Bolts and Fasteners: Manufacturer's standard units. Where built into exterior walls, hot-dip galvanized in accordance with ASTM A153, Class C or D.

C. Cold Rolled Steel Sheets: Commercial quality, stretcher leveled flatness, cold- rolled steel, free from scale, pitting or other surface defects, complying with ASTM A366 and A568 general requirements.

D. Galvanealed Steel Sheets: ASTM A924, A60 zinc coating. Use galvanized steel sheets for exterior hollow metal doors, door frames and door louvers. Internal reinforcing may be manufactured of hot rolled pickled and oiled steel per ASTM-A569.

E. Minimum gauges of hollow metal are specified below. Provide heavier gauge if required by details or specific condition. Entire frame and sidelight shall be of same gauge.
   1. 16 gauge: Labeled frames (or heavier if required by label).
   2. 14 gauge: Exterior door frames, window-wall and window frames.
   3. 16 gauge: Exterior doors.
   4. 20 gauge: Trim members.

F. Coating Materials, primer: Use manufacturer’s standard rust inhibiting primer conforming to ANSI-A224.1-1990.

G. Thermal-rated (insulating) assemblies for exterior doors: U factor of0.41 Btu/(hr x sq. ft x deg F) or better when tested in accordance with ASTM C236 or ASTM C976.

2.6 FABRICATION

A. Doors and frames prepared to receive hardware and in accordancewith ANSI A115 Series.

B. Hardware cutouts located in accordance with DHI recommendations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Transmit submittals of all products listed in this Section.

B. Ensure substrates are in suitable condition to receive the work.

3.2 INSTALLATION

A. Install frames in accordance with SDI 105 and fire-rated frames in accordance with NFPA 80.

B. Fit doors accurately in frames, maintaining clearances specified in SDI 100.

C. Install fire-rated doors with clearances as specified in NFPA 80.

D. Check and readjust operating hardware items.

END OF SECTION

SECTION 08 51 13 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 General Requirements, apply to this Section.

1.2 SUMMARY

A. This Section includes following:
   1. Aluminum-framed windows for exterior locations at overpass and stair enclosures.

PRODUCT DATA SHEET 1 - Fixed windows

1.1 RELATED SECTIONS
   1. Section 07 92 00 – Joint Sealants and Caulking
   2. Section 08 80 00 - Glazing

1.2 DEFINITIONS

A. Performance class designations according to AAMA/WDMA 101/I.S.-97 for:
   1. HC: Heavy Commercial.

B. Performance grade number according to AAMA/WDMA 101/I.S.-97:
   1. Design pressure number in pounds force per square foot used to determine the structural test pressure and water test pressure.

C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.

D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:

1. Size required by ANSI/AAMA/NWWDA 101/1.S.-97/NAFS for Architectural Windows-AW 80 and Heavy Commercial – HC ratings
2. Size indicated on Drawings.

B. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:
1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
2. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch, whichever is less, at design pressure based on testing performed according to AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Deflection Test or structural computations.

C. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
1. Mullion details, including reinforcement and stiffeners.
2. Joinery details.
3. Expansion provisions.
4. Flashing and drainage details.
5. Weather-stripping details.
6. Thermal-break details.
7. Glazing details.
8. Window cleaning provisions.
9. For installed products indicated to comply with design loads, include structural analysis data prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of aluminum windows and used to determine the following:
   a. Structural test pressures and design pressures from wind loads indicated.
   b. Deflection limitations of glass framing systems.

C. Samples for Initial Selection: For units with factory-applied color finishes.
1. Include similar Samples of hardware and accessories involving color selection.

D. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

E. Qualification Data: For manufacturer and installer.

F. Field quality-control test reports.

G. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency for each type, class, grade, and size of aluminum window. Test results based on use of downsized test units will not be accepted.

H. Maintenance Data: Submit Maintenance Data for specified window system.

I. Warranty: Special warranty as specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer of aluminum windows is a certified installer with a documented history installing manufacturer’s products according to manufacturer’s specifications.
   1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
   2. Engineering Responsibility: Preparation of data for aluminum windows, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aluminum windows' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
   1. Do not modify intended aesthetic effects, as judged solely by Engineer/Architect, except with Engineer/Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Engineer/Architect for review.

E. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
   1. Provide AAMA-certified aluminum windows with an attached label.

F. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Mock up can become part of the proposed wall. Coordinate with architect prior to beginning of installation.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.
   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
   3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for structural anchorage, glazing, flashing, weeping, sealants, and protection of finishes.
   4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
   5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Where field measurements cannot be made without delaying the Work, guarantee opening dimensions and proceed with fabricating aluminum windows without field measurements. Steel truss and structural steel drawings must be approved before the windows will be reviewed. Coordinate wall construction to ensure that actual opening dimensions correspond to guaranteed dimensions.

1.7 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure to meet performance requirements.
      b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
      c. Faulty operation of movable sash and hardware.
      d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
   2. Warranty Period:
      a. Window: Three years from date of Final Acceptance.
      b. Glazing: Five years from date of Final Acceptance.
      c. Metal Finish: Five years from date of Final Acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Thomas Manufacturing, Inc.
   2. All Seasons Windows & Doors; All Seasons Commercial Division, Inc.
   3. EFCO Corporation.
   4. Graham Architectural Products Corp.
   5. Kawneer; an Alcoa Company.
   6. TRACO.
   7. Or Engineer's Approved Equal

2.2 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength, and not less than 0.062-inch thickness at any location for the main frame and sash members.

B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
   1. Reinforcement: Where fasteners screw anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
   2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when aluminum window is closed.

1. Weather-Stripping Material: Elastomeric cellular preformed gaskets complying with ASTM C 509.
2. Weather-Stripping Material: Dense elastomeric gaskets complying with ASTM C 864.
3. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA 101/I.S.2/NAFS.
4. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.

F. Replaceable Weather Seals: Comply with AAMA 701/702.

G. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

H. Window manufacturer to provide all mullion covers, trim pieces such as brick mold, steel column covers, head, jambs, and sills as specified and/or shown on drawings.

I. Glazing: All glazing beads shall be extruded with a minimum height of 3/4”. Units shall accept 3/8” non-insulated laminated safety glass.

J. Thermal Barrier: The thermal barrier shall consist of a two-part, chemically curing, high strength, and pure polyurethane casting resin. This thermal barrier shall provide a continuous uninterrupted break around the entire perimeter of the frame and vent and it shall not be abridged by any metals, conductors or other similar materials. The cavity size of the thermal break shall be .630" wide, .375" high and shall have a throat opening of at least .312" wide. Residential size cavities will not be permitted.

K. Frame Construction: The frame is constructed from .125” nominal material wall thickness aluminum of 6063-T6 alloy and tempered with a depth of 2 1/2”. It features a standard equal leg. All joinery frame members shall be closely fit and double screwed. All frame joinery is sealed with a silicone sealant.

2.3 WINDOW

A. Window Type:
   1. Fixed

B. AAMA/WDMA Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA 101/I.S.2/NAFS unless more stringent performance requirements are indicated.
   1. Performance Class and Grade: AW80

C. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 58.

D. Thermal Transmittance: Provide aluminum windows with a whole-window, U-factor maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.

1. U-Factor: 0.55 Btu/sq. ft. x h x deg F or less.

E. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/WDMA 101/I.S.2/NAFS, Air Infiltration Test.
1. Maximum Rate: 0.1 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft.

F. Water Resistance: No water leakage as defined in AAMA/WDMA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/WDMA 101/I.S.2/NAFS, Water Resistance Test.
1. Test Pressure: 20 percent of positive design pressure, but not more than 15 lbf/sq. ft.

G. Forced-Entry Resistance: Comply with Performance Grade 10 requirements when tested according to ASTM F 588.

H. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/WDMA 101/I.S.2/NAFS.

2.4 GLAZING

A. Glass and Glazing Materials: Refer to Section 08 80 00 Glazing for glass units and glazing requirements applicable to glazed aluminum window units.

B. Refer to window schedule in the contract drawings.

2.5 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Fabricate aluminum windows that are re-glazable without dismantling sash or ventilator framing.

C. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.
1. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
2. Provide hardware with low conductivity or nonmetallic material for hardware bridging thermal breaks at frame or vent sash.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.

F. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as

indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

G. Sub frames: Provide sub frames with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch- thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide sub frames capable of withstanding design loads of window units.

H. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section 08 80 00 "Glazing" and with AAMA/WDMA 101/I.S.2/NAFS.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight window installation.
   1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.

2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials. Material to be insulated by use of pressure sensitive tape, zinc chromate primer, lacquer or bituminous paint.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
   1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Remove and replace non-complying aluminum window and retest as specified above.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION

SECTION 08 70 00 - HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. Section 09 90 10 Painting and Finishing
2. Section 09 91 14 Preparation of Surfaces
3. Section 08 11 00 Doors and Frames

1.2 SUMMARY

A. This Section includes furnishing all items of finish hardware for all canopies, railings, and other items in the Contract.

1.3 REFERENCES

A. Standards:
1. ANSI A156.1 – Butts and Hinges
2. ANSI A156.2 – Bored Locks and Latches
3. ANSI A156.3 – Exit Devices
4. ANSI A156.4 – Door Controls – Door Closers
5. ANSI A156.5 – Auxiliary Locks and Associated Products
6. ANSI A156.6 – Architectural Door Trim
7. ANSI A156.7 – Template Hinge Dimensions
8. ANSI A156.8 – Door Controls – Overhead Holders
9. ANSI A156.13 – Mortise Locks and Latches
10. ANSI A156.15 – Closer Holder Release Devices
11. ANSI A156.18 – Material and Finishes
12. NFPA 80 – Fire Doors and Windows

B. Codes:
1. Building Code of New York State 2016 with 2017 Universal Code Supplemental
2. NFPA 101 – Life Safety Code
3. ANSI A117.1 – Accessible and Usable Buildings and Facilities
4. ADA – Americans with Disabilities Act
5. UFAS - Uniform Federal Accessibility Standards
6. UL - Underwriter's Laboratories
7. WHI - Warnock Hersey International, Division of Inchcape Testing Services
8. State and Local Codes including Authority Having Jurisdiction

1.4 ADMINISTRATIVE REQUIREMENTS

A. Design Builder to coordinate keying requirements with Metro North Railroad.

1.5 QUALITY ASSURANCE

A. Substitutions
   1. All substitution requests must be submitted within the procedures and time frame as outlined in Division 01, General Requirements.

B. Supplier Qualifications
   1. A recognized architectural door hardware supplier who has maintained an office and has experience furnishing hardware in the project's vicinity.
   2. Hardware supplier shall have office and warehouse facilities to accommodate this project.
   3. Hardware supplier shall have in his or her employment at least one (1) Architectural Hardware Consultant (AHC) who is available at reasonable times during business hours for consultation about the project's hardware and requirements to the owner, Engineer and Contractor.
   4. Hardware supplier must be an authorized factory distributor of all products specified herein.

C. Installer: Firm with experience in installation of similar hardware to that required for this project, including specific requirements indicated.

D. Regulatory Label Requirements: Provide nationally recognized testing agency label or stamp on hardware for labeled openings. Where label requirements conflict with drawings or specifications, hardware conforming to label requirements shall be provided. Conflicts and proposed substitutions shall be clearly indicated in hardware schedule.

E. Pre-Installation Conference: Prior to the installation of hardware, manufacturer's representatives for locksets, closers, and exit devices shall (be available to) arrange and hold a jobsite meeting to instruct the installing Contractor's personnel on the proper installation of their respective products. A letter of compliance, indicating when this meeting is held and who is in attendance, shall be sent to the Engineer and Owner.

F. Provide hardware for fire-rated openings that comply with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of hardware that are listed by Underwriter's Laboratories (UL) or Warnock Hersey (WH) for use on types and sizes of doors indicated.

G. Marking and Packaging
   1. Properly package and mark items according to the approved hardware schedule, complete with necessary screws and accessories, instructions and installation templates for spotting mortising tools. Contractor shall check deliveries against accepted list and provide receipt for them, after which he is responsible for storage and care. Any shortage or damaged good shall be made without cost to the owner.
   2. Packaging of door hardware is the responsibility of the supplier. As hardware supplier receives material from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set and door numbers to match the approved hardware schedule. Two or more identical sets may be packed in same container.

H. Delivery
   1. The supplier shall deliver all hardware to the project site; direct factory shipments are not allowed unless agreed upon beforehand. Hardware supplier shall coordinate delivery times and schedules with the Design Builder. Inventory door hardware jointly with

representatives of hardware supplier and hardware installer/Design Builder until each is satisfied that count is correct.

2. No keys, other than construction master keys and/or temporary keys are to be packed in boxes with the locks.

I. Storage

1. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of work will not be delayed by hardware losses both before and after installation.

1.6 SUBMITTALS

A. General Requirements

1. Submit copies of finish hardware schedule in accordance with Division 01 – Submittal Procedures.

B. Schedules and Product Data

1. Schedules to be in vertical format, listing each door opening, and organized into "hardware sets" indicating complete designations of every item required for each door opening to function as intended. Any electronics shall also be included in the schedule. Hardware schedule shall be submitted within two (2) weeks from date the purchase order is received by the finish hardware supplier. Furnish four (4) copies of revised schedules after approval for field and file use. Note any special mounting instructions or requirements with the hardware schedule. Schedules to include the following information:
    a. Location of each hardware set cross-referenced to indications on drawings, both on floor plans and in door and frame schedule.
    b. Handing and degree of swing of each door.
    c. Door and frame sizes and materials.
    d. Keying information.
    e. Type, style, function, size, and finish of each hardware item.
    f. Elevation drawings and operational descriptions for all electronic openings.
    g. Name and manufacturer of each hardware item.
    h. Fastenings and other pertinent information.
    i. Explanation of all abbreviations, symbols and codes contained in schedule
    j. Mounting locations for hardware when varies from standard.
2. Submit catalog cuts and/or product data sheets for all scheduled finish hardware.
3. Submit separate detailed keying schedule for approval indicating clearly how the owner's final instructions on keying of locks has been fulfilled.

C. Installation Instructions: Provide manufacturer's written installation and adjustment instructions for finish hardware. Send installation instructions to site with hardware.

D. Samples

1. Upon request, samples of each type of hardware in finish indicated shall be submitted. Samples are to remain undamaged and in working condition through submittal and review process. Items will be returned to the supplier or incorporated into the work within limitations of keying coordination requirements.

E. Templates: Furnish a complete list and suitable templates, together with finish hardware schedule to Contractor, for distribution to necessary trades supplying materials to be prepped for finish hardware.

F. Operations and Maintenance Manuals
   1. Upon completion of construction and building turnover, furnish two (2) complete maintenance manuals to the owner. Manuals to include the following items:
      a. Approved hardware schedule, catalog cuts and keying schedule.
      b. Hardware installation and adjustment instructions.
      c. Manufacturer's written warranty information.
      d. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
      e. Name, address, and phone number of local representative for each manufacturer.
      f. Parts list for each product.
      g. One complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

G. All items, except as noted below, shall be warranted in writing by the manufacturer against failure due to defective materials and workmanship for a minimum period of one (1) year commencing on the date of final completion and acceptance. In the event of product failure, promptly repair or replace item with no additional cost to the owner.
   1. Mortise locksets: Five (5) years
   2. Exit Devices: Five (5) years
   3. Door closers: Ten (10) years

H. Replace shortages and incorrect items with correct material at no additional cost to Owner.

I. At completion of project, qualified factory representative shall inspect closer installations. After this inspection, letter shall be sent to Engineer reporting on conditions, verifying that closers have been properly installed and adjusted.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Refer to Sections 1.5.G, 1.5.H, and 1.5.I above.

1.8 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

E. Direct shipments not permitted, unless approved by Contractor.

1.9 WARRANTY

A. Special Warranty: Manufacture's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Years from date pf Substantial Completion, for durations indicated.

a. Closers:

1) Mechanical: 10 years.

2) Electrified: 2 years.

b. Exit Devices:

1) Mechanical: 3 years.

2) Electrified: 1 years.

c. Locksets:

1) Mechanical: 3 years.

2) Electrified: 1 years.

d. Continuous Hinges: Lifetime warranty.

e. Key Blanks: Lifetime

2. Warranty does not cover damage or faulty operations due to improper installation, improper use or abuse.

1.10 MAINTENANCE

A. Maintenance Tools:

1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Approval of manufactures other than those listed shall be in accordance with QUALITY ASSURANCE article, herein.

B. Approval of products from manufactures indicated as "Acceptable Manufacture" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

Item	Scheduled Manufacturer	Acceptable Manufacturer
Hinges	Ives (IVE)	Hager, McKinney, Stanley
Locksets & Deadlocks	Schlage (SCH)	Sargent, Falcon
Cylinders & Keying	Schlage (SCH)	Sargent, Falcon
Door Closers	Falcon (FAL)	LCN, Sargent
Door Trim	Ives (IVE)	Burns, Rockwood
Protection Plates	Ives (IVE)	Burns, Rockwood
Stops & Holders	Ives (IVE)	Burns, Rockwood
Thresholds & Weatherstrip	Reese (REE)	Pamko, Zero
Silencers	Ives (IVE)	Burns, Rockwood
Key Cabinets	Telkee (TEL)	HPC, Lund

C. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Engineer's approval.

2.2 MATERIALS

A. Screws and Fasteners
   1. All required screws shall be supplied as necessary for securing finish hardware in the appropriate manner. Thru-bolts shall be supplied for exit devices and door closers where required by code and the appropriate blocking or reinforcing is not present in the door to preclude their use.

2.3 FINISHES

A. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 or traditional U.S. finishes shown by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor shall ensure that the building is secured and free from weather elements prior to installing interior door hardware. Examine hardware before installation to ensure it is free of defects.

B. Ensure that walls and frames are square and plumb before hardware installation.

C. The installer shall notify the Engineer, in writing, of all unacceptable condition that could affect the proper operation of the finish hardware.

3.2 INSTALLATION

A. Mount hardware units at heights indicated in the following applicable publications, except as specifically indicated or required to comply with the governing regulations.
   1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute (DHI.)
   2. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."

B. All hardware shall be applied and installed in accordance with best trade practice by an experienced hardware installer. Care shall be exercised not to mar or damage adjacent work.

C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

D. Installation of hardware shall comply with NFPA 80 and NFPA 101 requirements.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment to substrate as necessary for proper installation and operation. Shim doors as required to maintain proper operating clearance between door and frame.

F. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

G. Install jamb-applied gaskets before closers, overhead stops, rim strikes, etc. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.

H. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant, forming tight seal between threshold and surface to which set. Unless otherwise specified or detailed, install thresholds with the bevel in vertical alignment with the outside door face. Notch and closely fit thresholds to frame profile. Securely and permanently anchor thresholds, using countersunk non-ferrous screws to match color of thresholds (stainless steel screws at aluminum thresholds).

I. Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

J. Locate floor stops not more than 4 inches from the wall.

K. Install door closers on corridor side of lobby doors and room side of corridor doors.

L. Use only fasteners supplied by or approved by the manufacturer for each respective item of hardware.

3.3 FIELD QUALITY CONTROL

A. The Contractor shall comply with AIA A201 1997 section 3.3.1 which reads as follows: "The Design Builder shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters."

B. Prior to the installation of hardware, manufacturer's representatives for locksets, closers, and exit devices shall arrange and hold a jobsite meeting to instruct the installing Contractor's personnel on the proper installation of their respective products. A letter of compliance, indicating when this meeting is held and who is in attendance, shall be sent to the Engineer and Owner.

C. The hardware supplier shall do a final inspection prior to building completion to ensure that all hardware was correctly installed and is in proper working order.

D. The manufacturer's representative shall do a final inspection prior to building completion to ensure that all hardware was correctly installed and is in proper working order.

E. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.4 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating

items as necessary to restore to proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Instruct owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes and usage of any electronic devices.

D. At final completion, and when H.V.A.C. equipment is in operation, installer shall make final adjustments to and verify proper operation of all door closers and other items of hardware. Lubricate moving parts with type lubrication.

E. Adjust door closers to meet opening force requirements of Uniform Federal Accessibility Standards.

F. Clean adjacent surfaces soiled by hardware installation.

G. Demonstrate electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

H. Deliver to the owner 1 complete set of installation and adjustment instructions, and tools as furnished with the hardware.

3.5 PROTECTION

A. Contractor shall protect all hardware, as it is stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase from paint, cleaning agents, weathering, carts/barrows, etc. Install any and all hardware at the latest possible time frame. Remove covering materials and clean hardware just prior to substantial completion.

B. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

3.6 DOOR HARDWARE SCHEDULE

SET#	HW-100
	EMR, COMM RM.
	Butts
1	Lockset
1	Deadbolt
1	Closer
1	Kick Plate
1	Stop
3	Silencers
1	Threshold
1	Weather stripping

END OF SECTION

SECTION 08 80 00 – GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. The scope of work specified in this section shall include but not be limited to the following stations;
   1. Scarsdale
   2. Hartsdale

B. Work Included: The Work of this Section shall include, but not be limited to, glass and glazing for the following:
   1. Elevator enclosure for proposed elevator.
   2. Elevator cab.

1.2 RELATED SECTIONS

1. SECTION 09 90 10 – Painting and Finishing
2. SECTION 08 70 00 – Hardware
3. SECTION 05 50 10 – Miscellaneous Metals
4. SECTION 09 96 23 – Graffiti Resistant Coatings

1.3 SYSTEM DESCRIPTION

A. Provide glass and glazing that will withstand normal thermal movement, wind loading and impact loading (where applicable), without failure of glass, failure of gaskets to remain watertight and airtight, nor deterioration of glass and glazing materials.
   1. Normal thermal movement is defined as that resulting from an ambient temperature range of 120 degrees F and from a temperature range within glass and glass framing members of 180 degrees F.
   2. Deterioration of insulating glass is defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, resulting from seal failure, and any other visual evidence.
   3. Deterioration of coated glass is defined as the development of manufacturing defects including peeling, cracking or other indications of deterioration in coating due to normal use.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each glazing material and fabricated glass product required, including installation and maintenance instructions. Indicate glass thickness to be used.
   1. Submit glass manufacturer's wind pressure analyses and thermal stress analysis; glass manufacturer's review of glazing systems Shop Drawings stating that glazing details are suitable.

2. Submit glass types and identification of glazing materials. Submit insulating glass unit certification.

B. Samples: Submit 12-inch square samples of each type of glass indicated, and 12-inch long samples of each color of gasket.

C. Certificates: Submit certificates from respective manufacturers attesting that glass and glazing materials furnished for Project comply with requirements of agencies having jurisdiction.
1. Separate certification will not be required for glazing materials bearing manufacturer's permanent labels that represent a quality control program of a certification agency or independent testing laboratory acceptable to authorities having jurisdiction.

D. Compatibility and Adhesion Test Report: Submit statement from sealant manufacturer that glass and glazing materials have been tested for compatibility and adhesion with glazing sealants and interpreting test results, with recommendations for primers and substrate preparation.

1.5 QUALITY ASSURANCE

A. Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" except where more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined.

B. Safety Glazing Standard: Provide required safety glass which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.

C. Single Source for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass.

D. Insulating Glass Certification Program: Provide insulating glass units permanently marked with appropriate certification label of the Insulating Glass Certification Council (IGCC).

E. Glazing for Fire-Rated Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and to prevent damage to glass and glazing materials from moisture, temperature changes, and direct exposure to sun, and from other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with glazing when air and substrate temperatures are outside the limits permitted by glazing material manufacturer or when joint substrates are wet or dirty.

B. During concrete work, provide whatever protection is required to protect for glass and sealant material that has been installed. Replace any materials damaged, as determined by the Commissioner.

1.8 WARRANTY

A. General: Submit warranties to repair or replace defective glass and glazing materials or workmanship for a period of not less than 5 years after date of Substantial Completion, or longer where specified.

B. Insulating Glass: Submit a warranty to replace defective insulating glass for a period of 10 years after date of Substantial Completion. Defects include failure of insulating glass edge seal.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass in thicknesses as needed to comply with requirements indicated.

B. Strength: Where float glass is indicated, provide annealed float glass, HS heat- treated float glass, or Kind FT heat-treated float glass**.** Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements for type, class and quality.

D. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048 requirements. Surface compression of heat strengthened glass shall be in the range of 3500 to 6500 psi.
   1. Provide heat treated glass where glass would be vulnerable to thermal breakage and where required for safety of persons.
   2. Provide fully tempered or heat strengthened glass where indicated or required by authorities having jurisdiction.
      a. Tempered glass shall comply with ANSI Z97.1.

E. Sizes: Fabricate glass to sizes required, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses to comply with Building Code, and as recommended by glass manufacturer, unless greater thickness is indicated.

2.2 PRIMARY GLASS PRODUCTS

A. Clear Float Glass: Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), thickness to meet code requirements.

2.3 HEAT-TREATED GLASS PRODUCTS

A. Uncoated Clear Heat-Treated Float Glass: Condition A, Type 1, Class 1, Quality q3, (glazing select), fully tempered except as noted.

B. Heat Strengthened Glass: Provide heat strengthened glass where required by design wind pressures or anticipated thermal stress, where fully tempered glass is not required.

C. Tempered Glass: Provide fully tempered glass only where safety glass is mandatory or where design pressures are beyond the capacity of heat strengthened glass. Tempered glass shall be free from inclusions.
   1. Provide tempered glass at entrance doors, vestibule doors and glazed panels, at steel door vision panels.

2.4 COATED GLASS PRODUCTS

A. Low Emissivity Glass: Provide pyrolytically coated clear Low-E glass where indicated, as manufactured by one of the following or equal as approved by the Engineer
   1. Interpane Coatings, Inc.
   2. Libbey Owens Ford Co.
   3. PPG Industries, Inc.
   4. Saint-Gobain.
   5. Spectrum Glass Products, Inc.
   6. SPI Glass Corp.

2.5 LAMINATED GLASS PRODUCTS

A. General: Refer to primary and heat-treated glass requirements for properties of uncoated glasses making up laminated glass.

B. Laminating Process: Fabricate laminated glass using laminator's standard process to produce glass free from defects.

C. Laminated Tempered Glass: ASTM C 1036, ASTM C 1172. Two sheets of double- strength clear sheet glass; Type I, Class 1, quality q3; permanently laminated together with minimum 0.030 inch thick sheet of plasticized polyvinyl butyral, which has been produced specifically for laminating glass.
   1. Kind: LT (laminated tempered), unless otherwise indicated.
   2. Clear Glass: Class 1 (clear).
   3. Thickness: 3/ 8 inch, unless otherwise indicated; but not less than required by structural loads.

D. Interlayer: Interlayer material as indicated below, in translucent white, and of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass and installation.
   1. Interlayer Material: Polyvinyl butyral sheets.
   2. Products: Subject to compliance with requirements, provide one of the following or equal as approved by the Engineer

a. Polyvinyl Butyral Interlayer:
   1) Saflex, Monsanto Co.
   2) Butacite, E. I. du Pont de Nemours & Co., Inc.

2.6 SEALED INSULATING GLASS UNITS

A. General: Provide insulating glass units complying with ASTM E 774 and with other requirements specified below, unless otherwise indicated. Provide insulating glass of 1 inch thickness unless otherwise shown.
   1. Insulating glass shall have double edge seals of polyisobutylene and an elastomeric sealant that are continuously bonded to both plates of glass, and compatible with glazing materials.

2.7 PATTERNED GLASS

A. Patterned Glass: ASTM C 1036, Type II (patterned glass, flat), Class 1 (clear), Form 3 (patterned), Quality q8 (glazing), Finish f1 (patterned one side); of pattern indicated in the Glass Schedule at the end of Part 3.

2.8 GLAZING GASKETS

A. Dense Gaskets: Extruded one piece gaskets of neoprene, complying with ASTM C 864, of profile required for a watertight seal, with a Shore A hardness of 75 + 5 for hollow profiles and 60 + 5 for solid profiles.

B. Cellular Gaskets: Preformed cellular neoprene gaskets of profile required for a watertight seal; complying with ASTM C 509, with a Shore A hardness of 40 + 5, to provide 20 to 35% compression.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by gasket manufacturer.

C. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness, 4 inches minimum length by width to suit glass thickness.

D. Shims: Shims used with setting blocks shall be of the same material, hardness, length and width as the setting blocks.

E. Edge Blocks: Same material as setting blocks, of 50-60 Shore A durometer, of size to limit lateral movement of glass.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify compliance with applicable tolerances; for functioning of weep system; for face and edge clearances; and for effective sealing of joinery. Report conditions detrimental to glazing work. Perform glazing work after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels immediately before glazing. Remove coatings which are not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with recommendations of glass manufacturers, of manufacturers of gaskets and other glazing materials, except where more stringent requirements are indicated by referenced glazing standards.

B. Glazing channels are intended to provide for necessary bite on glass, minimum edge and face clearances, with reasonable tolerances.

C. Protect glass from damage. Remove and dispose of glass units with damage or imperfections of kind that impairs performance or appearance.

3.4 GLAZING

A. Install glass as detailed. Use setting blocks where necessary to prevent movement.

B. Provide edge blocking to comply with referenced glazing standard. Install edge blocks securely, between the mid-height and top of glass.

C. Set units of glass in each series with uniformity of appearance.

D. Install sponge and dense gaskets to protrude slightly out of channel, to eliminate dirt and moisture pockets. Provide adequate anchorage to ensure that gaskets will not "walk" out.

3.5 PROTECTION AND CLEANING

A. Promptly protect installed glass from breakage with crossed streamers attached to framing and held away from glass. Do not apply markers on glass. Remove nonpermanent labels and clean glass.

B. Protect glass from contact with contaminating substances. If contaminating substances do come into contact with glass, remove immediately as recommended by glass manufacturer.

C. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

D. Wash glass on both faces not more than 4 days prior to date scheduled for inspections to establish date of Substantial Completion in each area of Project. Wash glass as recommended by glass manufacturer.

3.6 GLAZING SCHEDULE

A. GLS-01: Clear, vandal resistant acrylic with ribbed sides in a single block.

B. GL- 02: Insulated Glass for Station

C. Platform Waiting Room
1. Outboard lite: heat-strengthened, laminated, low iron clear glass
2. Inboard lite: : heat strengthened laminated, low iron clear glass
3. 1/2 inch argon filled air space.
4. Minimal silicone joint between panels
5. Frameless, restrained by top and bottom clamp only
6. Screen-printed ceramic manifestations.
7. Glazing part of tested Storefront Assembly meeting U-value = Engineered by design builder and approved by Engineer

D. GL- 04: Elevator Hoist way Enclosure
1. One (1) heat-strengthened, laminated, low iron clear glass thickness engineered by design builder and approved by Engineer
2. Translucent interlayer
3. Fire-rated.

E. GL- 05: Elevator Cab Doors
1. One (1): heat-strengthened, laminated, low iron clear glass thickness engineered by design builder and approved by Engineer

F. GL- 07: Glass Enclosure at Passenger Shelter
1. One (1 heat-strengthened, laminated, low iron clear glass thickness engineered by design builder and approved by Engineer
2. Screen-printed ceramic manifestations.

G. GL- 08: Industrial Design Panels
1. One (1) heat-strengthened, laminated, low iron clear glass thickness engineered by design builder and approved by Engineer
2. Ceramic frit in areas shown in the contract drawings
3. Hinged as noted on Contract Drawings

END OF SECTION

SECTION 08 90 00 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY

A. The Contractor shall furnish all labor, materials, tools equipment and services, and perform all operations necessary for the louvers and vent installation as indicated on the Contract Drawings and specified herein.

B. The scope of work specified in this section shall include but not be limited to the following stations
   1. Mechanical rooms at Scarsdale and Hartsdale Station

C. Requirements for metal regular and acoustical louvers.

1.2 RELATED DOCUMENTS

1. Section 07 72 00 Roof Accessories
2. Section 08 11 00 Doors and Frames
3. Section 09 90 10 Painting and Finishing
4. Section 09 91 14 Preparation of Surfaces

1.3 REFERENCES

A. Energy Conservation Construction Code of New York State

B. Structural Requirements: Design louvers to safely withstand dead load and live loads prescribed by governing building code.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A company designing, manufacturing, and installing products of this section which have performed in a satisfactory manner under comparable conditions for a period of 5 years.

B. Performance: Where louver performance requirements are specified, determine compliance in accordance with AMCA Standard 500.

C. Warranty: Manufacturer shall warrant for a period of two years that the wall system, including louvers and copings, materials and their finishes will be free from defects. The wall systems Design Builder shall warrant for a period of two years that the installation workmanship will be free from defects in materials and installation.

1.5 SUBMITTALS

A. Shop drawings showing material, finish, size of members, method of assembly, and installation and anchorage details. Show elevations, field measurements (if applicable), reinforcement, anchorages, and expansion provisions.

B. Samples for Engineer's Initial Selection: Submit at least 2 pieces of each type and color of finish, submit 12-inch-long sections of extrusions.

C. Samples for Verification of Finishes: For each type and color of finish, submit 12-inch-long sections of extrusions or formed sections and 6-inch-square sheets. Submit at least 2 pieces for each color showing full range of color variations.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
1. Schedule delivery of materials at the site at such time as required for proper coordination of the work. Receive materials in manufacture's unopened packages and bearing manufacturer's label.

B. Storage and Handling:
1. Store materials in a dry and well ventilated place, adequately protected from damage and exposure to the elements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Wall Louvers:
1. Products of the following manufacturers, provided they comply with requirements of the Contract Documents, will be among those considered acceptable:
a. Airline Products Company.
b. Airolite Company.
c. All-Lite Metal Company.
d. American Warming and Ventilating.
e. CESCO Products.
f. Construction Specialties, Inc.
g. Industrial Louvers, Inc.
h. Louvco, Inc.
i. Louvers & Dampers, Inc.
j. Penn Ventilator Company Incorporated.
k. Reliable Products/Hart & Cooley, Inc.
l. Ruskin Manufacturing Division/Tomkins Industries, Inc.
m. Approved equal

B. Door Louvers:
1. Products of the following manufacturers, provided they comply with requirements of the Contract documents, will be among those considered acceptable:

a. A-J Manufacturing Company.
b. All-Lite Metal Company.
c. Construction Specialties, Inc.
d. Reliable Products/Hart & Cooley, Inc.
e. Approved equal

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 or T-52 with temper recommended by louver manufacturer for required structural properties and to produce proper finish.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer to produce required finish.

C. Fasteners: Of same basic metal and alloy as fastened metal or 300 series stainless steel, unless otherwise indicated. Do not use metals that are corrosive or incompatible with joined materials.
1. Use types and sizes to suit unit installation conditions.
2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.
3. For aluminum members: Aluminum, stainless steel, or galvanized steel.
4. For steel or galvanized steel members: Stainless steel or galvanized steel.
5. For stainless steel members: Stainless steel.
6. Finish exposed-to-view fastener heads to match adjacent surface.

D. Anchors and Inserts: Of type, size, and material required for type of loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

E. Paint: Paint color to match color of Metal Wall Panels or door paint surrounding louver.

2.3 LOUVERS

A. Regular drainable louvers. Provide louvers profiles as indicated on architectural drawings.
1. Louver assembly shall be 2" or 3” deep with continuous blade. Blade and framing component shall be a minimum of 0.081 thick. Unused portions shall be blanked off with 0.050 aluminum sheet. Provide pan flashing made of the specified aluminum materials where indicated or required for drainage to the exterior and to prevent water entry at the sill.
2. Color: To be determined by Metro North.

B. Acoustical louvers.
1. Louvers shall have a continuous blade look with invisible vertical mullions.
2. Louvers shall be constructed entirely of aluminum, alloy 5005-H34. Blades shall be minimum 0.081” wall thickness and filled with sound absorbent fiberglass. Frames shall be minimum 0.081” wall thickness. Each louver shall be fitted with ½” mesh x 0.063” diameter aluminum bird screen in non-rewireable U-shaped frames for permanently securing screen mesh.

C. Screens: Removable type; provide screens exterior louvers.
   1. Frame: Fabricate from same material used for louver. Miter and reinforce frame corners.
      a. Fabricate frame from extruded or formed metal. Provide insert or driven spline for mesh attachment. Frame must be capable of being rewired.
   2. Insect screen mesh:
      a. 18 by 16 mesh, 0.011 inch aluminum wire.
   3. Position screen on inner louver face; attach using machine screws located 3 inches from corner and 12 inches on center between corners.

2.4 DOOR LOUVERS

A. Door Louver: Fixed inverted V-shaped blades, 1-3/8 inches deep, spaced 3/4 inch on center.
   1. Fabricate louvers and integral frame of extruded aluminum, minimum
   2. 0.050 inch thick.
   3. Frame style: Mitered trim frame, with welded corners; separate inner frame adjustable for door thickness and secured by countersunk screws.
   4. Insect screen: Provide 14 by 18 mesh aluminum wire screen. Provide rewireable spliced frame or channels in louver frame to receive screen.
   5. Finish: Factory prime & finish painted
   6. Color: To match finished door color selected by Engineer.

2.5 FABRICATION, GENERAL

A. Fixed type. Drainable Framing System. Head, sill and jamb sections shall have formed caulking slots to retain caulking. Head sections shall have exterior drip lip, sill sections and integral water stops. Furnish louvers with sill extension or separate sill.
   1. Provide clearance or recesses as required to accommodate sealant between louver and adjacent construction.

B. Structural Framing System: Extruded aluminum framing system including heads, sills, jambs, intermediate horizontals and interlocking mullions.
   1. Structural Performance: Fabricate louver system to withstand the effects of loads and stresses from wind and normal thermal movement without experiencing permanent deformation of components including blades, frames and supports; noise or metal fatigue caused by blade rattle or flutter; or permanent damage to fasteners and anchors.
      a. Wind Load: Uniform pressure (velocity pressure) of 60 LBS/SF.
      b. Temperature Change (Range): 100˚ F.

C. Make frame size 1/2-inch smaller than openings. Blades shall be stormproof and weather resistant type.

D. Louvers shall be equipped with bird screens and made to withstand a wind load of not less than 30 PSF. Provide 1/2-inch square mesh, 14 or 16-gage screens. Mount screens in removable, rewirable frames of same material and finish as the louvers. Prime and paint screens in colors selected by the Engineer.

E. Wall louvers shall bear the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500 and AMCA 511. The rating shall show a water

penetration of 0.20 ounces or less per square foot of free area at a free velocity of 800 feet per minute.

F. The louver system shall accommodate various performance criteria including pressure drop requirements, CFM requirements, static pressure drop, water infiltration, free area, and intake/exhaust velocities, etc. while maintaining a consistent exterior architectural line appearance. Louver blade spacing at all elevations and buildings shall be consistent regardless of these varying performance criteria. Provide louver profiles as indicated or where shown on architectural drawings.

G. Provide shop-welded joints between framing components, and between framing components and fixed louver blades, unless otherwise indicated or where field assembly is unavoidable.

2.6 FINISHES

A. Factory Prime Finish: Chemically clean and etch metal and apply at least one coat of manufacturer's standard corrosion-inhibitive thermosetting (baked) primer.

B. Color: As selected by the Engineer from manufacturer’s full range of custom colors (to match building exterior).

2.7 BLANK-OFF PANELS

A. Fabricate blank-off panels for exterior louvers from materials to comply with the following requirements:
   1. Finish: Match finish applied to louver with respect to coating type, except for color, which shall be black
   2. Attach blank-off panels to back of louver frames with clips.

B. Insulated, Blank-Off Panels: Laminated metal-faced panels consisting of insulating core surfaced on back and front with aluminum sheets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrates and openings to receive louvers are rigidly set, at proper lines and elevation, properly sized, and ready to receive louvers.

B. Do not proceed with installation until conditions detrimental to proper installation have been corrected.

3.2 PREPARATION

A. Transmit submittals required by this Section.

B. Coat contact surfaces of dissimilar metals with one or more coats of bituminous paint.

1. The following metals are not considered dissimilar: Aluminum, stainless steel, and zinc.

C. Apply one 15-mil dry film thickness coat of bituminous isolation coating to metal surfaces, other than galvanized steel, which will be in contactwith cementitious materials.

3.3 INSTALLATION

A. Locate and place louver units plumb, level, and at indicated alignmentwith adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to makea weather tight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants andjoint fillers.

E. Repair finishes damaged by cutting, welding, soldering, and grinding operations required for fitting and jointing. Restore finishes so there isno evidence of corrective work. Return items that cannot be refinished in the field to the shop, make required alterations, and refinish entire unit, or providenew units.

F. Protect galvanized- and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

G. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses, to make louver joints weather tight.

H. Repair finishes damaged by cutting, welding, soldering, and grinding operations required for fitting and jointing. Restore finishes so there isno evidence of corrective work. Return items that cannot be refinished in field to the shop, make required alterations and refinish entire unit, or providenew units.

3.4 CLEANING

A. Remove protective material from pre-finished surfaces immediately after installation.

B. Wash exposed surfaces using mild detergent; thoroughly clean inside corners.

C. Remove excess sealant by moderate use of mineral spirits or other solvent recommended by sealant manufacturer.

D. Touch up marred or abraded areas of finished elements. If satisfactory touch- up cannot be accomplished, remove and replace element.

END OF SECTION

SECTION 09 36 00 - CAST-IN-PLACE TACTILE WARNING STRIPS

PART 1 - GENERAL

1.1 DESCRIPTION

A. SUMMARY

1. Under this section, the Contractor shall provide all materials, equipment and labor for furnishing and installing tactile warning strips in accordance with the plans, specifications and directions of the Engineer.

2. The work of this Section is necessitated by ADA (Americans with Disabilities Act) regulations (ADAAG 10.3.1 (9). 10.3.2 (2) requiring that at commuter rail key stations, platform edges bordering a drop-off and not protected by platform screens or guard rails have a detectable warning.

1.2 SCOPE

A. Work included in this section shall include tactile warning strips, which comprise the following components:

1. Mold sections
2. Dome Mixture and Field Mixture, if applicable
3. Sealer

1.3 RELATED SECTIONS

A. Section 03300 – Cast-In-Place Concrete

1.4 REFERENCES

A. ADAAG: ADA Accessibility Guidelines for Buildings and Facilities.

B. Assessment of Detectable Warning Devices for Specification Compliance or Equivalent Facilitation (FTA-DC-90-7710-92-1).

1.5 SUBMITTALS

A. The Contractor shall submit the following:

1. A complete list of all equipment and materials to be furnished and installed under this Section. All submittals and resubmittals shall be in accordance with the Contract Documents. A notarized Certificate of Compliance shall be submitted.

2. A schedule of completion and sequence of delivery of the work to be furnished and installed under this Section. This schedule shall include at least:

a. Preparation of Shop Drawings and Metro-North's review period for approval.

b. Prototype construction, review, final approval, manufacture and sequence of delivery.

3. Shop Drawings describing the tactile warning strips and their installation, which shall include indications of the extent of installation of the strips; typical dimensions, thicknesses and surface geometry; the typical methods of attachment of the strips, etc.

4. Documentation of all aspects of the tactile warning strips and their installation not described by the Shop Drawings, including, but not limited to test results confirming the conformity of the tactile warning strips with this Specification, recommended methods of maintenance and repair of the installed tactile warning strips and estimated service life and unit replacement cost for all components of the tactile warning strips.

1.6 QUALITY ASSURANCE

A. The work of this Section shall be performed by firms with at least five (5) years of experience in the manufacture and installation of tactile warning strips.

B. For the actual manufacture, fabrication and installation of the tactile warning strips, only persons who are thoroughly trained and experienced in the required skills shall be used.

C. In acceptance or rejection of the manufactured units, no allowance will be made for lack of skill on the part of the manufacturer.

D. Materials and equipment shall be in full compliance with Contract Documents and approved Shop Drawings.

E. The Contractor shall provide a ten year unconditional guarantee of the tactile warning strips against any defects in workmanship of design.

F. Metro-North reserves the right to inspect the manufacturing process to ensure conformity with the Contract Documents.

1.7 PRODUCT HANDLING

A. The Contractor shall use all means necessary to protect the tactile warning strips from the time of fabrication until the time of completion and final acceptance of the Work of this Section.

B. The Contractor shall be responsible for replacing all materials damaged up until the time of completion and final acceptance of the Work of this Section.

C. Store materials in a dry location at temperatures not exceeding 90 deg F or lower than 35 deg F.

1.8 PROJECT CONDITIONS

A. Install materials in accordance with all safety and weather condition required by the manufacturer or as modified by applicable rules and regulations of local, state, and federal authorities have

jurisdiction.

B. Do not apply materials if rain is anticipated within 3 hours of application.

C. Substrate and air temperature must remain above 40 deg F for at least 4 hours after application of materials and remain above freezing for 24 hours.

PART 2 - PRODUCTS

2.1 TILES

A. Tile Material

1. The basis of design is Strongwarn SWADA 1000/2000 Detectable Warning Surface System or approved Equal. The system consists of a 2'x4' mold, and a dome mixture to create the warning domes. Afterwards, the tactile strip is covered in a field mixture and then a pigmented sealer is applied.
   a. Mold, 8 SF
   b. #82 Truncated Dome: carboxylated latex emulsion with a factory apportioned power catalyst
   c. #32 Field: two component blend of latex vinyl copolymer with factory apportioned catalyst powder and pigments
   d. #4 Pigmented Sealer
   e. Tile Properties

2. Results of tests of the properties of the tiles under conditions simulating those of the actual installation shall meet the following criteria:

Standard	Property	Criteria
ASTM E-96	Water Vapor Transmittance	14.3 perms
ASTM C 1202	Water Permeability	System 560 Coulombs
ASTM C-501	Wear Resistance	Wear Index 14.5
ASTM C-1082-89	Slip Resistance	Dry leather 0.88, dry neolith 0.96, wet neolith 0.93, reduction due to wetting 1.6%
ASTM D-822	Compressive Strength	5100 psi
ASTM C-1042	Shear Bond Strength	28 days: 1860 psi
ASTM C-293	Flexural Strength	1900 psi min.
ASTM E-84	Fire Test	System Rated Class A
Environmental	MSDS	Zero VOC, non-toxic, non-hazardous

3. Material: Epoxy-Based Vitrified Polymer Composite

B. Tile Color

1. The color of the tiles shall be yellow. The color yellow shall comply with the current version of Metro-North Canary Yellow. The tiles shall be the same color throughout the thickness of the tile material.

C. Tile Surface Geometry

1. The wearing surface of the tiles shall be planar, with regular spaced truncated dome protrusions and drainage grooves. The geometry and spacing of the truncated domes and the grooves shall conform with that described by the Contract Drawings to within a tolerance of plus or minus 0.02".

D. Products

1. Tactile warning strip shall be Strongwarn SWADA 1000/2000, Strongwall Industries, Inc. 107 Chestnut Street, Ridgewood, NJ 07450 (201)-445-4633, info@strongwall.com or approved equal.

2.2 SEALANT

A. Sealant as recommended by the tile manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Preparation of the substrate (wearing surface): Shotblast or scarify, and vacuum so that the surface is clean, then water blast with a pressure of at least 2000 psi.

B. Spray wearing surface with concrete cleaner, allow to soak for 30 minutes without drying, and waterblast with 4000 psi minimum.

C. Mix truncated dome mixture as indicated by the manufacturer. (In the case of Strongwarn #82, a liquid and powder must be mixed). Mix until uniform mixture consistency has been achieved, no longer than 2 minutes. Keep in mind the pot life as indicated by the manufacturer.

D. With clean water, dampen wearing surface to a dull finish. Place molds onto wearing surface, with 3/16” inch gaps between the adjacent short sides of the molds.

E. Place truncated dome mixture #82 onto mold with a squeegee and trowel, ensuring the material fills all mold openings. Remove excess material from exposed surfaces of the mold.

F. Do not remove mold until mixture has cured enough to resist pressure with index finger. Follow all minimum cure times for manufacture. For Strongwarn SWADA:
1. 45-55 deg F: 12 hours
2. 55-70 deg F: 6 hours
3. Above 70 deg F: 3 hours
4. Do not apply in temperatures below 45 deg F.

G. Mix field components as indicated by manufacturer. For Strongwarn, stir #32 emulsion for about 30 seconds using a heavy duty drill, and then pour into a clean container. Gradually add #32 catalyst powder, mixing continuously. Do not reverse this process. After all powder has been added, mix for a minimum of 3 minutes. Keep in mind the pot life as indicated by the

manufacturer.

H. Apply to domed surface with a long nap roller and allow to cure for one hour minimum at 70 deg F or as indicated by the manufacturer.

I. Apply a second coat of field (Steps G and H).

J. Stir sealer as indicated by manufacturer, and apply to dry field surface with a long nap roller. Allow to cure for one hour minimum at 70 deg F or as indicated by the manufacturer.

K. Apply two coats of sealer (step J).

L. Allow to cure overnight before accepting traffic.

M. At expansion joints in the concrete the molds shall be placed and cut if needed to allow the expansion joint to continue the full length of the platform.

3.2 CLEAN UP AND PROTECTION

A. Following completion of installation, all surfaces of the Work of this section shall be cleaned.

B. All debris resulting from the Work of this Section shall be removed from the Work area.

C. All Work of this Section shall be protected until Project Completion and final acceptance.

END OF SECTION

SECTION 09 90 10 – PAINTING AND FINISHING

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the Contract Drawings and as specified herein, including, but not limited to, the following:
   1. Prime painting unprimed surfaces to be painted under this Section.
   2. Painting all items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.
   3. Painting all ferrous metal (except stainless steel) exposed to view.
   4. Painting all galvanized ferrous metals exposed or partially exposed to view.
   5. Painting interior concrete block exposed to view.
   6. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
   7. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers, lighting fixtures, and the like, which are exposed to view through these items.
   8. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
   9. Painting of any surface not specifically mentioned to be painted herein or on drawings, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, shall be included as though specified.

1.2 RELATED SECTIONS

1. SECTION 09 91 15 Paint Requirements

1.3 MATERIALS AND EQUIPMENT NOT TO BE PAINTED

A. Items of equipment furnished with complete factory finish, except for items specified to be given a finish coat under this Section.

B. Non-ferrous metals, except for items specified and/or indicated to be painted.

C. Finished hardware, excepting hardware that is factory primed.

D. Surfaces not to be painted shall be left completely free of droppings and accidentally applied materials resulting from the work of this Section.

E. Steel surfaces designated as requiring High Performance Coatings shall be painted in accordance with industry standards and manufacturers requirements.

F. Steel surfaces designated as requiring Intumescent Fireproofing shall be painted in accordance with industry standards and manufacturers requirements.

1.4 QUALITY ASSURANCE

A. Job Mock-Up
   1. In addition to the samples specified herein to be submitted for approval, apply in the field, at their final location, each type and color of approved paint materials, applied 10 feet wide, floor to ceiling of wall surfaces, before proceeding with the remainder of the work, for approval by the Engineer. Paint mock-ups to include door and frame assembly.
   2. These applications when approved will establish the quality and workmanship for the work of this Section.
   3. Repaint individual areas which are not approved, as determined by the Engineer, until approval is received. Assume at least two paint mock-ups of each color and gloss for approval.

B. Qualification of Painters: Use only qualified journeyman painters for the mixing and application of paint on exposed surfaces.

C. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Engineer in writing of any anticipated problems using the coating systems as specified with substrates primed by others.

D. All paints must conform to the Volatile Organic Compounds (VOC) standards of prevailing Federal, State and local codes and ordinances including but not limited to the New York City Air Pollution Control Code.

E. Inspection
   1. All paints, solvents, varnish and architectural coatings shall be subject to inspection at the place of manufacture and subject to such tests as may be ordered by the Engineer. The Engineer may be at the paint manufacturer's plant to witness the entire manufacturing process including filling and closing of the cans for each batch of paint manufactured. Samples of the paint may be taken by the Engineer or forwarded to the Engineer as directed. The Engineer shall have access, at all times, to all places to inspect the methods of manufacture and shall have liberty to inspect the daily laboratory records and analysis of all such paints, solvents, varnishes or architectural coatings as are subject to his inspection. Such analyses as are required will be made by the Engineer.
   2. The Contractor shall furnish the Engineer with certification, on the manufacturer's letterhead, stating the name of the Contractor or Subcontractor, the Contract number, and the point of delivery, in addition to stating that the paint meets the VOC requirements of the New York City Air Pollution Control Code as stated in Paragraph 1.3, Air Pollution Code, the New York State Environment Conservation Law - Part 205, and the requirements of the Contract Documents.

F. Before purchasing any paint or varnish the Contractor shall obtain approval of the manufacturer who is to furnish such paint and/or varnish in the manner as directed by Metro North.

G. A manufacturer of paint and/or varnish in order to be acceptable shall have manufactured good grades of paint and/or varnish for at least 5 years. The manufacturer's plant shall be within 100

miles of New York City, unless approved by the Engineer, in order that the cost of inspection shall be a minimum.

1.5 SUBMITTALS

A. Materials List
   1. Before any paint materials are delivered to the job site, submit to the Engineer a complete list of all materials proposed to be furnished and installed under this portion of the work, including Materials Safety Data Sheets (MSDS).

B. Samples
   1. Accompanying the materials list, submit to the Engineer copies of the full range of colors available in each of the proposed products.
   2. Upon direction of the Engineer, prepare and deliver to the Engineer two (2) identical sets of Samples of each of the selected colors and glosses painted onto 8-1/2" x 11" x 1/4" thick material; whenever possible, the material for Samples shall be the same material as that on which the coating will be applied in the work.

C. Manufacturer's Recommendations: In each case where material proposed is not the material specified or specifically described as an acceptable alternate in this Section of these specifications, submit for the Engineer's review the current recommended method of application published by the manufacturer of the proposed material.

D. Manufacturer’s certification that the paints are compatible with the surfaces upon which they will be applied.

1.6 PRODUCT HANDLING

A. Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at time of use.

B. Protection
   1. Store only the approved materials at the job site, and store only in a suitable and designated area restricted to the storage of paint materials and related equipment.
   2. Use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.
   3. Use all means necessary to protect paint materials before, during and after application and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.7 EXTRA STOCK

A. Upon completion of this portion of the Work, deliver to the Owner an extra stock of paint equaling approximately ten (10) percent of each color and gloss used and each coating material used, with all such extra stock tightly sealed in clearly labeled containers.

1.8 MANUFACTURER’S WARRANTY

A. Provide manufacturer's standard written warranty for minimum one year beginning from the date of Substantial Completion for the products of this Specification Section detailing the provisions of the warranty coverage.

PART 2 - PRODUCTS AND MATERIALS

2.1 PAINT MANUFACTURERS

A. Except as otherwise noted, provide the painting products listed for all required painting made by one of the manufacturers listed in the paint schedule. These companies are Benjamin Moore, MAB Paints, ICI Dulux and Sherwin Williams (S-W) or approved equal. Comply with number of coats and required minimum mil thicknesses as specified herein.

2.2 MATERIALS

A. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only to recommended limits.

B. Colors and Glosses: All colors and glosses shall be as indicated in the Contract Documents and approved by the Engineer. Certain colors will require paint manufacturer to prepare special factory mixes to match colors indicated in the Contract Documents.

C. Coloring Pigment: Products of or furnished by the manufacturer of the paint or enamel approved for the work.

D. Linseed Oil: Raw or boiled, as required, of approved manufacture, per ASTM D 234 and D 260, respectively.

E. Turpentine: Pure distilled gum spirits of turpentine, per ASTM D 13.

F. Shellac: Pure gum shellac (white or orange) cut in pure denatured alcohol using not less than four (4) lbs. of gum per gallon of alcohol.

G. Driers, Putty, Spackling Compound, Patching Plaster, etc.: Best quality, of approved manufacture.

H. Heat Resistant Paint: Where required, use heat resistant paint when applying paint to heating lines and equipment.

2.3 GENERAL STANDARDS

A. The various surfaces shall be painted or finished as specified below in Paragraph 2.4. However, the Engineer reserves the right to change the finishes within the range of flat, semi-gloss or gloss, without additional cost to the Authority.

B. All paints, varnishes, enamels, lacquers, stains and similar materials must be delivered in the original containers with the seals unbroken and label intact and with the manufacturer's instructions printed thereon.

C. All painting materials shall bear identifying labels on the containers with the manufacturer's instructions printed thereon.

D. Paint shall not be badly settled, caked or thickened in the container, shall be readily dispersed with a paddle to a smooth consistency and shall have excellent application properties.

E. Paint shall arrive on the job color-mixed except for tinting of under-coats and possible thinning.

F. All thinning and tinting materials shall be as recommended by the manufacturer for the particular material thinned or tinted.

G. It shall be the responsibility of the Contractor to see that all mixed colors match the color selections shown in the Contract Documents and approved by the Engineer prior to application of the coating.

2.4 SCHEDULE OF FINISHES

A. Selected Manufacturer will provide its full range of custom colors.

B. Exterior Galvanized Ferrous Metal
   1. Primer:
      a. Moore IMC Acrylic Metal Primer (M04).
      b. MAB Rust-O-Lastic HydroPrime II (073-189).
      c. Sherwin-Williams Galvite HS Primer, B50WZ30.
   2. First Coat:
      a. Moore Urethane Alkyd Gloss Enamel (Z22).
      b. MAB Rust-O-Lastic Silicone Alkyd (069 line).
      c. Sherwin-Williams Industrial Enamel HS, B54Z-400.
   3. Second Coat:
      a. Same as recommended first coat.
   4. Or approved equal system from sole manufacturer and with written confirmation from the manufacturer of compatibility of each coat including the substrate.

C. Exterior or semi-exterior (unconditioned area) Ferrous Structural Metal
   1. Primer:
      a. Moore IMC Acrylic Metal Primer (M04).
      b. MAB Rust-O-Lastic HydroPrime II (073-189).
      c. Sherwin-Williams Galvite HS Primer, B50WZ30.
   2. First Coat:
      a. Moore Urethane Alkyd Gloss Enamel (Z22).
      b. MAB Rust-O-Lastic Silicone Alkyd (069 line).
      c. Sherwin-Williams Industrial Enamel HS, B54Z-400.
   3. Second Coat:
      a. Same as recommended first coat.

2.5 EXISTING SURFACES TO BE PAINTED

A. Existing surfaces shall be painted in accordance manufactures standards, and Metro North requirements, except that first or prime coat may be eliminated where existing paint is sound, as

determined by Metro North. Where existing paint must be removed down to base material, provide first or prime coat as specified.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL WORKMANSHIP REQUIREMENTS

A. Only skilled mechanics shall be employed. Application may be by brush or roller. Spray application only upon acceptance from the Engineer in writing.

B. The Contractor shall furnish the Engineer a schedule showing when he expects to have completed the respective coats of paint for the various areas and surfaces. This schedule shall be kept current as the job progresses.

C. The Contractor shall protect his work at all times, and shall protect all adjacent work and materials by suitable covering or other method during progress of his work. Upon completion of the work, he shall remove all paint and varnish spots from floors, glass and other surfaces. He shall remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and shall leave his part of the work in clean, orderly and acceptable condition.

D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide ample in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.

E. Remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.

F. All materials shall be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.

G. Coverage and hide shall be complete. When color, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Authority.

H. All coats shall be dry to manufacturer’s recommendations before applying succeeding coats.

I. All suction spots or “hot spots” in plaster after the application of the first coat shall be touched up before applying the second coat.

3.3 PREPARATION OF SURFACES

A. Existing Surfaces: Clean existing surfaces requiring paint or finishing, remove all loose and flaking paint or finish and sand surface smooth as required to receive new paint or finish. No "telegraphing" of lines, ridges, flakes, etc., through new surfacing is permitted. Where this occurs, Contractor shall be required to sand smooth and re-finish until surface meets with Engineer's approval.

B. General
   1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished shall be perfectly dry, clean and smooth.
   2. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
   3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.

C. Metal Surfaces
   1. Weld Fluxes: Remove weld fluxes, splatters, and alkali contaminants from metal surfaces in an approved manner and leave surface ready to receive painting.
   2. Bare Metal: Thoroughly clean off all foreign matter such as grease, rust, scale and dirt before priming coat is applied. Clean surfaces, where solder flux has been used, with benzene. Clean surfaces by flushing with mineral spirits. For aluminum surfaces, wipe down with an oil free solvent prior to application of any pre-treatment.
   3. Shop Primed Metal: Clean off foreign matter as specified for "Bare Metal." Prime bare, rusted, abraded and marred surfaces with approved primer after proper cleaning of surfaces. Sandpaper all rough surfaces smooth.
   4. Galvanized Metal: Prepare surface as per the requirements of ASTM D 6386.
   5. Metal Filler: Fill dents, cracks, hollow places, open joints and other irregularities in metal work to be painted with an approved metal filler suitable for the purpose and meeting the requirements of the related Section of work; after setting, sand to a smooth, hard finish, flush with adjoining surface.

D. Wood Surfaces: Sand to remove all roughness, loose edges, slivers, or splinters and then brush to remove dust. Wash off grease or dirt with an approved cleaner. Fill all cracks, splits, nail holes, screw holes, and surface defects with putty after the priming coat has been applied. Putty shall be brought up flush with the surface and sanded smooth and touched-up with primer when dry.

E. Block Masonry Surfaces: Thoroughly clean off all grit, grease, dirt mortar drippings or splatters, and other foreign matter. Remove nibs or projections from masonry surfaces. Fill cracks, holes or voids, not filled under the "Masonry" Section, with Portland cement grout, and bag surface so that it has approximately the same texture as the adjacent masonry surface.

F. Testing for Moisture Content: Contractor shall test all plaster, masonry, and drywall surfaces for moisture content using a reliable electronic moisture meter. Contractor shall also test latex type fillers for moisture content before application of top coats of paint. Do not apply any paint or sealer to any surface or to latex type filler where the moisture content exceeds seven (7) percent as measured by the electronic moisture meter.

G. Touch-Up: Prime paint all patched portions in addition to all other specified coats.

3.4 MATERIALS PREPARATION

A. Mix and prepare painting materials in strict accordance with the manufacturer's directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

C. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.

D. Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied. Tint undercoats to match the color of the finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

A. General
   1. Apply paint by brush or roller in accordance with the manufacturer's directions. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by the paint manufacturer for material and texture required.
   2. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried. Sand between each enamel or varnish coat application with fine sandpaper, or rub surfaces with pumice stone where required to produce an even, smooth surface in accordance with the coating manufacturer's directions.
   3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.
   4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
      a. "Exposed surfaces" is defined as those areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.
   5. Paint interior surfaces of ducts and plena, where visible through registers, louvers or grilles, with a flat, non-specular black paint, before final installation of equipment.
   6. Paint all metal and concrete surfaces between inside face of dome and back of cable net above Level 4 with flat, non-specular black paint, powder coated where indicated.
   7. Paint the back sides of access panels, removable or hinged covers to match the exposed surfaces.
   8. Finish doors on tops, bottoms, and side edges the same as the faces, unless otherwise indicated.

9. Enamel finish applied to wood or metal shall be sanded with fine sandpaper and then cleaned between coats to produce an even surface.
10. Paste wood filler applied on open grained wood after beginning to flatten, shall be wiped across the grain of the wood, then with a circular motion, to secure a smooth, filled, clean surface with filler remaining in open grain only. After overnight dry, sand surface with the grain until smooth before applying specified coat.

B. Scheduling Painting
1. Apply the first coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
2. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Prime Coats: Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

D. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.

E. “Touching-Up” of Factory Finishes: Unless otherwise specified or shown, materials with a factory finish shall not be painted at the project site. To “touch-up,” the Contractor shall use the factory finished material manufacturer’s recommended paint materials to repair abraded, chipped, or otherwise defective surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage by the painting and finishing work. Leave all such work undamaged. Correct any damages by cleaning, repairing or replacing, and repainting, as acceptable to the Engineer.

B. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.7 CLEAN UP

A. During the progress of the work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.

B. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

3.8 SUBMITTAL APPROVALS

Item No.	Paragraph No.	Submittal	Approval By
1.	1.4.e.2	VOC Certification	Engineer
2.	1.5.a	Product Data, Materials List and Including MSDS	Engineer
3.	1.5.b	Samples	Engineer
4.	1.5.c	Manufacturers Recommendations,	Engineer
5.	1.5.d	Manufacturers Certification	Engineer
6.	1.4.a	Mock-up	Engineer
7.	1.9.a	Manufacturer's Warranty	Engineer

Notes:

1. This table does not include approvals for "or-equal" proposals. Approvals for "or-equal" proposals are covered in Specification Section 1B, Paragraph 1.38.

END OF SECTION

SECTION 09 91 14 - PREPARATION OF SURFACES

PART 1 - GENERAL

1.1 SUMMARY

A. The Contractor shall prepare surfaces to be coated as outlined in the Steel Structures Painting Council's (SSPC) surface preparation specifications.

B. The Contractor shall furnish all manpower, equipment and services necessary and incidental to protect the environment by means of containment, collection and removal of old paint chips, corrosion residues, spent abrasives and newly applied paint hereafter referred to as waste material that results from blasting and other cleaning and painting operations performed in the field.

PART 2 - PRODUCTS

2.1 SUMMARY

A. All materials and equipment used for the performance of the Work must be submitted to and approved by the Engineer prior to use.

B. All abrasives shall be free of corrosion producing contaminants as well as free of oil, grease or other deleterious contaminants. The abrasive material selected for blasting operations shall be such as to produce a cleaned surface and shall also produce a pattern depth suitable for the application of the specified coating(s). The use of silica sand will not be permitted.

C. Solvents, thinners, detergents and other cleaning materials for use in surface preparation work shall be as recommended by the coatings manufacturer and shall be identified by product number or generic type. They shall also conform to all applicable Local, State or Federal Laws, regulation or code.

D. Potable water for cleaning purposes must be supplied by the Contractor for all locations.

E. Materials and equipment used for environmental protection shall be approved by the Project Manager. Any material or equipment that is determined to be deficient or that becomes damaged to the extent that it no longer fulfills the requirements of this specification or its intended use shall be replaced or repaired as directed by the Engineer, at the Contractor's expense.

F. All materials and/or containers shall be properly marked and labeled to allow verification with applicable material safety data sheets, application precautions and instructions which shall be submitted in accordance with these specifications.

PART 3 - EXECUTION

3.1 There will be two means of surface preparation on this Contract.

A. Steel Structures Painting Council (SSPC); Surface Preparation Specifications; SP-6/NACE No. 3 (Commercial Blast) with Recycled Ferrous Metallic Abrasives
   1. A definition of Commercial Blast cleaned surface is when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion, products, and other foreign matter, except for staining. Staining shall be limited to no more than 33 percent of each square inch of surface area and may consists of light shadows, slight streaks, or minor discoloration's caused by stains of rust, stains of mill scale, or stains of previously applied paint. All blast cleaned surfaces shall conform to SSPC VIS 1 - "Guide and Reference Photographs for Steel Surfaces Prepared by Dray Abrasive Blast Cleaning".
   2. Abrasives- Provide recyclable abrasives that are dry and free of oil, grease, and corrosion producing, or their deleterious contaminants. The use of silica sand in prohibited.
   3. When using recyclable abrasives, provide all equipment needed to recover and clean the abrasives for reuse in compliance with SSPC Abrasive Specification No. AB-2 "Cleanliness of Recycled Ferrous Metallic Abrasives".

B. Steel Structures Painting Council (SSPC); Surface Preparation Specifications; SP-3 (Power Tool Cleaning)
   1. A definition of Power Tool cleaned surface is the removal of all loose mill scale, loose rust, loose paint, and other loose detrimental foreign matter. It is not intended that adherent mill scale, rust and paint be removed by this process. Mill scale, rust, and paint are considered adherent if they cannot be removed by lifting with a dull putty knife.

3.2 GENERAL REQUIREMENTS

A. The prime coat shall be applied before the surface starts to rust and/or as specified in Section 1.23, "Paint Requirements" of this Contract.

B. For dry abrasive blasting, the Contractor is prohibited from making final surface preparations to steel surfaces when the relative humidity is above 85% or when the relative humidity is expected to exceed 85% before the prime coat or paint is applied. The Contractor shall, at his own expense, re-work the steel surface in the event rust appears. The Contractor shall consult with the Engineer who is responsible to monitor the relative humidity and other weather conditions.

C. Before applying any coatings, all fine dust and residue remaining on the surfaces after performing the specified surface preparation shall be removed from the prepared surfaces by vacuuming with High Efficiency Particulate-Air (HEPA) filters.

D. Sample areas of surface preparation shall be prepared by the Contractor for the various cleanliness levels to be used as a standard for the job. The Painting Contractor must obtain the Engineer's approval, for the degree of cleanliness, for all sample areas prior to proceeding with work.

E. Public Safety & Environmental Protection

1. Environmental Ground Protection.
    a. Coverage shall be provided on or over the ground under all structures that are to be cleaned and painted.
    b. Depositing or dropping waste materials into water and onto the ground or roadways below the structure outside the specified containment areas will not be permitted. Ground tarps shall also be used in the general work or storage area on Metro-North property. Water that collects in ground tarps must be tested and properly disposed of.
    c. Cleaning or painting operations shall not be performed when the direction or velocity of prevailing winds causes waste materials to fall outside the containment area. If wind or other factors prevent containment acceptable to the Engineer the Contractor shall use drapes or other means to prevent drift beyond all containment areas.

F. Ground Protection
1. Ground Protection shall consist of the following:
    a. Covers or other methods approved by the Engineer, capable of catching and holding waste materials shall be provided on or over the ground under the structure and in other areas where material and equipment are stored.
    b. The cover provided shall include all areas beneath the structure. The length of the cover shall be determined by the length of the work location, and the width shall be at least 10 feet greater than each side of the area directly being worked on. The cover shall be positioned in such a manner as to contain and prevent the loss of waste materials.
    c. Cover on or over roadways, railroads, sidewalks or other similar areas shall not present a hazard of any kind, as determined by the Engineer, and no cover shall remain in place overnight unless otherwise authorized by the Engineer.
    d. All waste materials that collect on a bridge deck or on a highway pavement and paved shoulder under a structure or on covers shall be removed at least once a day or more frequently if directed by the Engineer. No waste material shall remain on the bridge deck, pavement or containment covers overnight.
    e. If approved by the Engineer, the Contractor may use other methods or modifications for ground protection that will accomplish the results required by this specification.
    f. The reuse of tarps contaminated with dried paint or other foreign matter, will be prohibited unless approved by the Project Manager.
    g. Gray water from the decontamination facility or other facilities shall be tested and disposed of in accordance to instructions provided by the Project Manager.

G. Containment System(s)

1. Prior to blasting and for the duration of any abrasive blasting operation the Contractor shall provide a Class 1 containment system as described in part "b" of this section, including covers, tarps, scaffolds, supports and shrouds or other means which will totally enclose the work area to contain all waste material within the enclosure in order to prevent the material from becoming airborne or contaminating the environment in any fashion. This shall include any water used for wet abrasive blasting or power washing. The Contractor shall remove all waste material from containment structure at least once a day or as directed by the Engineer. Materials used to construct the containment structure shall be air impermeable and properly reinforced to safely hold all anticipated loads.
2. The Contractor shall provide the above mentioned containment structure and ventilation system in accordance with the Steel Structures Painting Council SSPC-GUIDE 6I (CON)

- "Guide for Containing Debris Generated during Paint Removal Operations", Table 1 Containment Classification "Class 1" Metro-North's Specifications for Treatment of Lead Based Painted Surfaces.

3. Metro-North Railroad shall provide the services of a qualified environmental sub-contractor to monitor the quality of emissions which may be emitted into the surrounding environment. Ambient air testing will be performed every day of commercial blasting.
4. At the beginning of the blasting operation the Painting Contractor shall conduct personnel air samples in the worker's breathing zone to assure that workers are not being exposed to levels of lead above the Permissible Exposure Level (PEL). Air samples will be conducted on each job classification that has potential exposure to lead. These test results shall be supplied to Metro-North within seven (7) days after the results are submitted to the Contractor. Personnel air sampling shall be repeated every thirty (30) days or at every new bridge location which ever sooner to verify and confirm compliance with the PEL and protective equipment.
5. Metro-North will engage the services of a sub-contractor to conduct ambient air monitoring. If any of the methods used to monitor emissions exceeds the acceptable limits including limits calculated as per the National Ambient Air Quality Standards, the blasting operation being monitored shall immediately cease and the Contractor shall rework, upgrade, the containment system to lower emissions to be within acceptable limits at no additional cost to Metro-North.
6. The Contractor shall submit the enclosure schemes (containment and ventilation designs), and hazardous waste collection methods for each bridge requiring abrasive blasting for approval. Enclosure schemes with the use of power tool surface preparation SP-3 shall also be submitted for approval for each bridge.
7. Only solid floor platforms or rigid hanging structures will be allowed to contain the underside of the bridge. The Contractor shall submit working drawings showing containment details. These drawings shall be stamped by a NYS Licensed P.E. and copies of all calculations shall also be submitted for review by the Project Manager for approval.
8. Where Class 1 containment platforms are installed under a structure and over active roadways for SP-6 surface preparation, a minimum clearance must be maintained at all times for the safe passage of vehicles as per the approved Maintenance and Protection of Traffic Plan.
9. The handling of waste shall be in accordance with the attached Metro-North Specifications for Treatment of Lead Based Painted Surfaces Section” Waste Handling" of this Contract.

H. Alternates

1. The Contractor may choose an alternative method of surface preparation to those specified herein, if evidence is given that the final results are compatible and acceptable for paint application.
2. To implement an alternate method of surface preparation the Contractor shall submit the alternative method for approval with details as to the savings and evidence that the results will be the same. The savings may be in reducing the amount of airborne contaminants, reducing the amount of hazardous waste generated, safer working conditions, etc. No alternative, which has been proposed by the Contractor, shall be performed without prior written approval of the Engineer.

I. Worker Safety

1. The Contractor is responsible to maintain a program that satisfies the latest OSHA standards for the Construction Industry (29CFR1926) at a minimum and shall be responsible to protect and train his employees on worker safety, health hazards, etc.

2. The Contractor shall have a written Safety Program specific to this project which is to be submitted to Metro-North for approvals per the Contract Terms and Conditions.
3. In addition, the Painting Contractor shall have a written Lead Health and Safety program which is to be submitted to Metro-North for approval and imposed on all his employees involved in lead paint removal operations for this Contract as per Section 02 83 19 “Lead Abatement.

END OF SECTION

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SECTION 09 91 15 - PAINT REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. Under this section the Contractor shall furnish, handle, store, prepare and apply coatings as described herein, for Scarsdale and Hartsdale Stations

1.2 Related Sections

1. SECTION 09 90 10 Painting and Finishing

PART 2 - PRODUCTS

2.1 MANUFACTURE OF PAINT

A. All paint furnished under this Contract shall meet the Volatile Organic Compound (VOC) restrictions set by the New York State Department of Environmental Conservation and be non-lead paint. The paint shall be produced by a reputable paint manufacturer, to be approved by the Engineer.

B. All paint of the same type used for this Contract shall be made by the same manufacturer.

C. All finish coat paint shall be low-gloss Blue or as directed by the Project Manager. A draw-down of all color samples shall be submitted to the Engineer for approval of the color prior to application. When required to match existing paint, the Contractor shall obtain sample color chips of the existing finish coat paint from the structure prior to the batching of paint and deliver sample chips to the paint manufacturer in order to match the color of finish coat paint.

D. All paints shall be produced by an experienced, properly equipped manufacturer who has had prior experience in manufacturing paints of the general character specified. The manufacturer shall provide references to structures painted with paints of the same character on which satisfactory service has been rendered for a period of not less than fifteen years.

E. The paint manufacturer shall notify the Engineer prior to the grinding and mixing of any paint so that at the Engineers discretion a representative can be present to take samples of the paint for analysis. The manufacturer shall furnish to the Engineer for analysis, free of cost, samples of all raw materials used in the manufacture of paint if requested by the Engineer. Analysis of the raw materials may be made from time to time as the Work progresses to ensure that all materials used are of a uniform quality and meet the requirements of the specifications.

F. The vehicles, pigments and finished paint covered by these specifications are to be produced from raw materials of the highest quality only and carefully selected and combined by the most modern quality control compliance methods, in plants sufficiently equipped with the necessary scientific controls to produce satisfactory products of a uniform consistency within the tolerances specified.

2.2 PACKAGING AND SHIPPING

A. All of the finished products shall be delivered to their destination in metal containers clearly marked with the Lot and Batch numbers, type and color, quantity, gross, tare and net weights, as well as the name of the manufacturer and Contract or order number under which the shipment is made. All materials furnished shall have a certified material test report (CMTR) stating that the material furnished complies with Contract Specifications, or Manufacturers technical data sheets. Copies of all CMTR's shall be sent to the Engineer for each different batch.

B. All paints shall be received at the point of use in original containers and carefully stored. All paint used shall be freshly mixed and shall be ordered in advance of its use to insure an adequate supply of paint being on hand at all times so as not to delay the work.

C. The paints specified are packaged for application under normal conditions without further reduction. There shall be no thinning or other modification of the paint except upon, and in accordance with, express written stipulation by an authorized representative of the manufacturer of the paint, and with the specific written approval of the Engineer.

2.3 STORAGE OF PAINT

A. The Contractor shall store all flammable materials in approved storage containers and at locations as approved by the Engineer. Storage containers shall be a minimum of 50 feet from any facility.

B. Paint in storage at the shop or in the field shall be stored so as to be protected against freezing, excessive heat and in accordance with manufacturer’s recommendations. Suitable devices shall be maintained at the point of storage and use of the paint for agitating and thoroughly mixing the paint prior to its use for the work. These mixing devices shall consist of some mechanical rotary machine equipped with paddles which can be inserted into the containers to agitate and emulsify the contents thoroughly.

2.4 PAINT INSPECTION AND TESTING

A. All raw materials and finished products (paints) are subject to inspection and testing by the Engineer to verify compliance to referenced specifications or his authorized representative. Metro-North shall be the sole judge as to their satisfactory quality and efficiency based on approved methods of inspection and testing.

B. All finished products may be sampled at the place of manufacture and analyzed by the Engineer's testing laboratory. All finished products shall be subject to testing and analysis; samples will be taken by MN's Consultant Firm from painter's buckets at any point at which the painting work is being done or on the samples secured from the original containers delivered to the work site for application to the structure. No paint shall be applied to the structure until the paint has been tested and approved by MN's Consultant Firm's designated testing laboratory. Paint tested and found to be unacceptable shall be labeled in such a manner to prevent its use and removed from the job site in a timely fashion.

2.5 TESTING METHODS

A. All percentages given in these paint specifications are by weight unless otherwise specified. Limits are expressed as percent of total.

B. Federal Test Method Standard No. 141 "Paint, Varnish Lacquer and Related Materials:
1. Sampling and Testing" form an integral part of these paint specifications. Specific Federal and ASTM references are listed:

Title	
Fineness of grind	ASTM-D-1210
Color	ASTM-D-2244
Coarse particles and skins in oil base paints & pastes	Federal Test Method 141.....4091
Drying Time	ASTM-D-1640
Gloss	ASTM-D-523
Phthalic anhydride content in Resins	ASTM-D-563
Pigment content	ASTM-D-2698
Solids by weight	ASTM-D-2369
Solids by volume	ASTM-D-2697
Sampling for inspection	ASTM-D-3925
Self lifting test Federal Test	Method 141.....6252
Sag resistance (mils)	ASTM-D-4400
Skinning	ASTM-D-1849
Non-volatile vehicle Federal Test	Method 141....4053
Viscosity	ASTM-D-562
Weight per gallon	ASTM-D-1475
VOC Content	ASTM-D-2369

PART 3 - EXECUTION

3.1 APPLICATION OF PAINT

A. No paint shall be applied when the ambient temperature is below 40 degrees F or the relative humidity is greater than 85% unless allowed by the paint manufacturer. No paint shall be applied when the receiving surface temperature is less than 40 degrees F nor more than 100 degrees F. Paint shall not be applied upon dirty, dusty or damp surfaces or upon metal containing frost, nor shall it be applied when the air is misty or (in the opinion of the Engineer) otherwise unsatisfactory for work.

B. All pockets shall be thoroughly cleared of water, mud, dirt, and other accumulations, and the surfaces to receive paint shall be thoroughly dry and clean before paint is applied.

C. All surfaces to be painted shall be approved by the Engineer prior to the application of paint.

D. At the start of the painting operations and as requested by the Engineer the Contractor shall arrange for a Technical Representative (not a Sales Representative) from each paint manufacturer to be present to verify that proper methods are being implemented and that the coating systems will perform as expected. The representative shall check surface preparation, mixing, application

and other aspects of the cleaning and painting operations and make any necessary recommendations to the Engineer in writing.

E. Paint shall be thoroughly stirred, by means of mechanical mixers, before being removed from the containers, and to keep the pigments in suspension it shall also be stirred while being applied.

F. Paint shall be applied by round or oval brushes. Flat brushes or rollers may be used on the large plate surfaces between connections as approved by the Engineer. When rollers are used, the nap size and type shall be of such quality to properly wet the substrate and produce a smooth uniform coating. Spraying of paints will be permitted in a contained area only. On all metal surfaces which are inaccessible for paint brushes, the paint shall be applied with sheepskins or daubers especially constructed for the purpose.

G. The paint shall be manipulated so as to produce a uniform even coating in close contact with the metal or with previously applied paint; in general the primary movement of the brush shall describe a series of small circles to thoroughly fill all the irregularities in the surface, after which the coating shall be smoothed and thinned by a series of parallel strokes. On vertical surfaces the final strokes shall be vertical. When rollers are used they shall, in general, be moved in such a way to ensure complete coating of the surface, after which the coating shall be back rolled to create a smooth uniform finish.

H. All painting shall be performed in a neat and workmanlike manner. The paint shall be thoroughly applied and well brushed onto the cleaned surfaces and into all cracks and fissures without leaving fins or runs.

I. Prior to the application of any coat of paint, all damage to the previous coat shall be touched up with the corresponding specified paint for that coat, each coat being allowed to dry thoroughly before the subsequent coat is applied. The Contractor shall restore in accordance with paint specifications and with the number of coats herein specified, any damaged paint marred by his operations, regardless of the condition of the paint at the time the operation began.

J. All paint shall be applied in strict accordance with the manufacturer’s recommendations.

K. The dry film thickness (DFT) will be determined in accordance with SSPC-PA2, Paint Application Specification No. 2 - Measurement of Dry Film Thickness with Magnetic Gages.

L. Areas failing to meet the specified minimum dry film thickness shall be over-coated with the same type of coating to produce at least the total DFT required.

M. Coatings applied containing unauthorized thinners, coatings applied over unapproved surfaces and coatings applied contrary to this specification shall result in the re-cleaning and repainting the surface. Re-cleaning, repainting or over-coating, if required, shall be performed by the Contractor to the satisfaction of the Engineer and at no additional costs to Metro-North.

N. Primer coats shall be applied within the same day as the abrasive cleaning operation and before flash rusting occurs to the cleaned surface. Re-cleaning will be required when the Painting Contractor fails to coat the prepared surfaces within the same day at no additional costs to Metro-North.

O. The Contractor shall comply with all minimum and maximum time limits for coating and re-coating over the primer or intermediate coats as specified by the paint manufacturer for the

various types of coatings being utilized. When primer and intermediate coatings are applied and not re-coated within thirty (30) days the surfaces shall be thoroughly washed or cleaned as specified by the Engineer prior to the application of the next coat of paint. Surfaces that were coated, not completed, and left over the winter months shall be cleaned to the satisfaction of the Engineer and re-primed or re-coated with an additional coat of previously applied paint. All necessary work, required due to the Painting Contractor's failure to meet specified time limits stated herein, shall be performed to the Engineer's satisfaction and at no additional costs to Metro-North.

3.2 COATING SYSTEMS

A. The specified coating system shall be applied so as to produce the dry film thickness (DFT) within the range specified.

B. All coating systems shall be applied as specified for each coating system. Each coat of paint shall be tinted or shaded to distinguish it from previously applied or existing coatings.

C. All nuts, bolts, rivets, welds, edges and other irregular surfaces, shall have a stripe coat of the specified coating applied by brushing prior to applying the primer coat as specified below to assure proper coverage of these surfaces:

1. Thoroughly coat all surfaces with special attention to hard-to-reach areas, and irregular surfaces such as lacing bars and rivets. When coating configurations such as bolts, apply the material from multiple directions to assure complete coverage. o Unless stipulated otherwise in the Specifications, thoroughly apply a stripe coat to all edges, welds, crevices, rivets, bolt threads, bolt heads, areas of pitted steel and other surface irregularities. o Apply the stripe coat by brush or spray. When spraying, supplemental brush application is mandatory to ensure complete and thorough coverage. When brushing organic zinc primers, repeatedly stir the material with the brush during use to prevent settling of the zinc.
2. When applying the stripe coat prior to the full coat, do not apply the full coat until the stripe coat has dried according to the recoat times in the Paint System Tables.
3. When applying the stripe coat after the full coat, do not apply the stripe coat until the full coat has cured sufficiently to withstand foot traffic. Do not apply the next coat until the stripe coat has cured for the recoat times shown in the Paint System Tables.

D. The various coating systems to be utilized for this Contract are shown below. The manufacturers specified are only used to indicate paint that meets the performance requirements of this specification.

1. PAINT SYSTEM No.1 Used with SSPS-6 - Shall be one complete prime and finish coat of a two component, low VOC, epoxy barrier coat.
   a. Manufacturer: Sherwin Williams Edison, New Jersey (201) 287-4000
      1) Coat: Prime and finish: 1 coat
      2) Coatings: Dura-Plate 154 Epoxy Splash Zone Coating
      3) DFT (mils): 20-25
   b. Manufacturer: International Paint Houston, Texas (713)682-1711
      1) Coat: Prime and finish: 1 coat
      2) Coatings: Interzone 954
      3) DFT (mils): 20-25
   c. Colors : Federal Standard Color Blue, FS35187 or as approved by the engineer.

2. PAINT SYSTEM No.2 Used with SSPS-3 - Shall be one complete prime coat of a two component epoxy; full intermediate coat of an epoxy , and one complete finish coat of a two component urethane.
   a. Manufacturer Sherwin Williams Cleveland, Ohio (216) 566-2000
      1) Prime Coat: Macropoxy 920 Preprime, DFT 1.5-2 mils
      2) Int. Coat: Macropoxy 646, DFT 4-6 mils
      3) Finish Coat: Acrolon 218 HS Acrylic Polyurethane, DFT 3-6 mils
   b. Manufacturer International Paint Houston, Texas (713) 682-1711
      1) Prime Coat: Interseal 670, DFT 4-6 mils
      2) Int. Coat: Interseal 670, DFT 3-4 mils
      3) Finish Coat: Interthane 870 UHS, DFT 3-4 mils
   c. Colors
      1) Primer -as per manufacture (excluding white)
      2) Intermediate- white
      3) Top - Federal Standard Color Blue, FS35187.
3. PAINT SYSTEM No.3 Used with SSPS-6 - Shall be one complete prime coat of a zinc rich organic lead free epoxy; one complete intermediate coat one complete finish coat of a two component acrylic urethane enamel.
   a. Manufacturer Sherwin Williams Cleveland, Ohio (216) 566-2000
      1) Prime Coat: Zinc Clad III HS Organic Zinc Rich Epoxy Primer, DFT 2-3 mils
      2) Int. Coat: Macropoxy 646, DFT 4-6 mils
      3) Finish Coat: Acrolon 218 HS Acrylic Polyurethane, DFT 3-6 mils
   b. Manufacturer International Paint Houston, Texas (713) 682-1711
      1) Prime Coat: Interzinc 315 B, DFT 3-4 mils
      2) Int. Coat: Interguard 475H, DFT 4-6 mils
      3) Finish Coat: Interthane 870 UHS, DFT 3-4 mils
   c. Colors
      1) Primer -as per manufacture (excluding white)
      2) Intermediate- white
      3) Top - Federal Standard Color Blue, FS35187.

3.3 PROTECTION

A. The following provisions shall be used in conjunction with other applicable Sections of these Specifications.
   1. The Contractor shall furnish and install tarpaulins or other means enclosing the immediate site or area of all painting operations to insure complete protection of the public, and property both on and below the bridges, against possible damage from scrapings, paint drippings and from wind-blown paint. The type, quantity and placement of tarpaulin protection must be submitted for approval of the Engineer before start of painting operations. The Contractor shall have a sufficient quantity of tarpaulins in reserve, and shall be prepared to install same, to provide for unexpected variations in winds and for other contingencies. These requirements will be rigidly enforced, and the Contractor accordingly will not be permitted to proceed with field operations unless the required tarpaulins are in place.
   2. Any material or equipment that is determined to be deficient or that becomes damaged to the extent that it no longer fulfills the requirements of this specification or its intended use shall be replaced or repaired as directed by the Engineer, at the Contractor's expense. Tarpaulins coated with dried flaking paint may not be reused.

3. The Contractor shall require workers to wear the proper personal safety equipment while performing painting activities. At a minimum the personal safety equipment shall be as specified in the manufacturer's literature for the material(s) being handled and/or applied. At the end of each work shift the Contractor shall remove all paint, paint cans and painting equipment from the work area and properly dispose of or store these items in an approved location. All equipment and rigging that is left in-place shall be properly secured. Storage of paint and equipment on or around the bridge structures is strictly prohibited.

END OF SECTION

SECTION 09 96 00 - HIGH PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Requirements for epoxy coatings on concrete masonry unit walls, non-slip surfacing on concrete floors, and integral seamless epoxy cove wall base.

B. Requirements for clear graffiti resistant coating to be applied to all exposed structural steel and concrete accessible to the public throughout the project site.

C. The Contractor shall furnish all labor, materials, equipment, supervision and incidentals necessary to apply the high performance coatings as indicated on the Contract Drawings, and as directed by the Engineer.

1.2 RELATED DOCUMENTS

A. Division 01 General Requirements.

1.3 REFERENCES

A. American Society for Testing and Materials:
   1. ASTM D4263, Standard testing for indicating moisture in concrete by the plastic sheet method.

B. Building Code of New York State.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Environmental Conditions: Do not apply material if it is raining or snowing or if such conditions appear to be imminent. Do not apply during outgassing of moisture. Maximum moisture content of substrate shall not exceed 4% by weight. Minimum application temperature 45ºF (10ºC) and rising.

B. Protection: Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified coating.

C. Condition the specified product as recommended by the manufacturer.

1.5 QUALITY ASSURANCE

A. All materials must be delivered in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers. Damaged material must be removed from the site immediately.

B. Store all materials off the ground and protect from rain, freezing or excessive heat until ready for use. Store materials in undamaged condition with seals and labels intact as packaged by the manufacturer.

C. The Contractor shall be pre-qualified by the manufacturer as an approved installer of the decorative system. The Contractor shall submit with bid a letter from the manufacturer stating this approval.

D. Manufacturer's qualifications: The manufacturer of the specified product shall be ISO 9001 certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis.

E. All work shall be done when the ambient temperature is 50□F or higher. The manufacturer's instructions regarding the temperature, surface preparation and all other aspects shall be strictly followed.

F. The concrete substrate shall be at least 28 days old before the application of the system. The moisture content of the substrate shall be determined just prior to application of the system by use of a moisture meter or ASTM D4263 (plastic sheet method). Moisture content shall be 4% or less by weight, if moisture meter is used. No water shall be present under plastic sheet if ASTM D4263 is used.

G. After surface preparation, the surface shall be wiped with a soft, dark cloth to detect the presence of dust or dirt. No dirt or dust shall be seen on cloth. If present, continue with surface preparation procedures.

H. Prior to application, the Contractor shall test for oil contamination by observing the behavior of water on the concrete surface. If oil is present, the water will stay in the form of droplets and will not spread out. Completely remove oil with an appropriate approved commercial grade cleaner. Rinse and dry.

I. The Contractor shall schedule a site meeting with a representative of the product manufacturer prior to commencement of work.

J. Deliver products in original, unopened containers with the manufacturer's name, labels, product identification and batch numbers. Store and condition the product in full compliance with the manufacture's recommendations.

K. Install materials in accordance with all safety and weather conditions required by manufacturer or as modified by applicable rules and regulations of local, state and federal authorities having jurisdiction. Consult Material Safety Data Sheets for complete handling recommendations.

1.6 SUBMITTALS

A. Product description of the manufacturer showing product composition, concrete preparation, application and finish.

B. Color charts of available colors for selection by the Engineer.

C. All submittals are to be in accordance with Division 01 – Submittal Procedures.

D. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
   1. Recycled Content:
      a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
      b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
      c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
      d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
   2. Local/Regional Materials:
      a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
      b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
      c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
      d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.
   3. VOC data:
      a. Epoxy Floor Coating
         1) Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.
         2) Submit Green Seal Certification and description of the basis for certification.
      b. Adhesives:
         1) Submit manufacturer's product data for adhesives. Indicate VOC limits of the product. Submit MSDS highlighting VOC limits.
         2) Submit Green Seal Certification to GS-36 and description of the basis for certification.
         3) Submit manufacturer's certification that products comply with Bay Area AQMD Reg. 8, Rule 51 for containers larger than 16 oz and with California Air Resources Board (CARB) for containers 16 oz or less.
         4) Biobased materials:
            a) Indicate type of biobased material in product.
            b) Indicate the percentage of biobased content per unit of product.
            c) Indicate relative dollar value of biobased content product to total dollar value of product included in project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
   1. Schedule delivery of materials at the site at such time as required for proper coordination of the work. Receive materials in manufacture's unopened packages and bearing manufacturer's label.

B. Storage and Handling:
   1. Store materials in a dry and well ventilated place, adequately protected from damage and exposure to the elements.

1.8 WARRANTY

A. Provide a written warranty from the manufacturer from the manufacturer against defects of materials for a period of five (5) years, beginning with date of substantial completion of the project and in accordance with provisions of the recommended maintenance procedures.

B. Any repair under this guarantee shall be done at no cost to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Epoxy Coatings:
   1. Sika, Inc.
   2. Dur-A-Flex.
   3. Sherwin-Williams.
   4. Approved equal.

B. Graffiti Resistant Coatings:
   1. Sacrificial Anti-Graffiti manufactured by PROSOCO, Inc., "SC-1 Sacrificial Anti-Graffiti coating"
   2. Tnemec Co., Inc.
   3. Approved equal.

2.2 MATERIALS

A. The two (2) component, VOC compliant epoxy resin adhesive, primer shall be as follows:
   1. Primer "Sikafloor 261 – System 2 (regular) as manufactured by Sika Corporation or approved equal, with and approximate coverage of 200- sq.f./ gal. (8 mil. w.f.t.).

B. Two-component, high solids, non-slip, textured, epoxy coating. Sikafloor 261- System 2 Thixo (Special B) as manufactured by the Sika Corporation or approved equal. Apply one coat of Sikafloor 261 with an approximate coverage of 100-130 sq. ft./gal. at 12-16 mils wet.

C. Integral, seamless Epoxy Cove Wall Base with ¾" radius, color to match epoxy floor.

D. Colors: Refer to architectural drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Transmit submittals required by this Section.

B. Furnish products as indicated.

C. Surface must be clean, sound and dry. Remove dust, laitance, grease, curing compounds, bond inhibiting impregnations, waxes and any other contaminants.

D. Concrete should be cleaned and prepared to achieve a laitance and contaminant free, open texture surface by blast cleaning or equivalent mechanical means. (CPS3 as per ICRI guidelines). The compressive and the tensile strength of the concrete substrate should be as per manufacturer's requirements.

3.2 INSTALLATION, EPOXY COATING

A. Follow manufacturer's instructions for surface preparation, material storage, application, mix ratio, solids content, pot life, re-coat time and curing time.

B. Surface Preparation:
   1. Surface must be clean, sound, and dry.
   2. Concrete: Shotblast, sandblast, or use other approved mechanical methods. All projections and rough spots shall be dressed off to achieve a level surface prior to application.
   3. Repair any cracks larger than 1/16th inch by sealing the underside of the floor and ponding repair product over the crack until rejection.

C. Sample. Using the preparation methods, products, and application methods described herein, create a minimum 20 square foot sample for the owner's approval. Obtain written approval from the owner that the sample meets requirements or should be adjusted. Consult with the manufacturer's rep to make any changes in the square footage coverages and product needed to fit the owner's requirements.

D. Mixing: Pre-mix each component separately. Follow manufacturer's detailed instructions as noted on the current data sheet. Mix with a low-speed drill and paddle until uniform in color. Mixed only that quantity that can be used within its pot life.

E. Primer: Spread primer at 8 mil thickness over the area then backroll until coverage is uniform with no puddling. Primer must be worked well into surface to ensure adequate penetration and to avoid pinholes. Comply with product manufacturer's installation instructions. Allow a minimum 24 hour cure before applying top coat.

F. Top Coat: Apply floor finish to properly prepared dry substrate using high- quality hand trowels or notched squeegees at a uniform coverage without ponding. Finish with texture roller to achieve the desired surface texture. Allow to cure for 24 hours.

3.3 INSTALLATION, GRAFFITI RESISTANT COATING

A. Examine conditions of work in place before beginning work; report defects.

B. Do not apply when temperature is below 40 Degrees F.

C. Storage:
   1. General: Store in properly ventilated separate structure not less than 50'- 0" from any other structure on the site.
   2. Temperature: Maintain minimum of 45 degrees F and a maximum of 90 degrees F.
   3. Fire Prevention: Take necessary precautions to prevent fire; remove paint-soiled rags and waste each day or store in metal containers with covers in the storage structure.

D. Protection: Protect adjacent surfaces not scheduled for graffiti resistant finish from damage resulting from coating operations.

E. Surface Preparation: Prepare surfaces in strict compliance with manufacturer’s instructions.

F. Mix resin components and pigments per manufacturers’ instructions.

G. Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

H. Graffiti Resistant Coating:
   1. General: Apply minimum two (2) coats; allow adequate drying time between coats.
   2. Dry Film Thickness: Minimum 1-2 mils per coat; minimum 3 mills for 2 coat application.

I. Cleaning: Keep premises free from accumulation of waste and rubbish. At the completion of work remove surplus materials, rubbish, and debris.

END OF SECTION

SECTION 09 96 23 - GRAFFITI-RESISTANT COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Description: Provide Graffiti Resistant Coatings, as shown and specified per Contract Documents.

1.2 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Samples: General: Submit specified colors for each surface-finishing product.
   1. Field Samples:
      a. General: In place, on material scheduled to be finished, illustrating coating color, texture and finish. Locate where directed; accepted sample may remain as part of the Work.
      b. Size: One (1) entire unit as scheduled to be finished

C. Product Data: Submit manufacturer's specifications, data, and installation instructions for review.

D. Certificates: Submit statement of VOC compliance with state and local regulations.

E. Closeout:
   1. Extra Stock: Deliver one percent (1%) or a minimum of five (5) gallons of each color, type and surface texture of paint installed. Label each container with color, type, texture and location.
   2. Guarantee:
      a. General: Provide, in required form, for a period of one (1) year from date of final acceptance by Owner.
      b. Criteria: Color and finish appearance shall remain unchanged throughout entire guarantee period.
      c. Provide manufacturer’s warranty
   3. Maintenance Data: Manufacturer's instructions.

1.3 QUALITY ASSURANCE

A. General: Refer to Section 01 40 00 - Contractor's Quality Control System.

B. References:
   1. American Society of Testing Materials (ASTM):
      a. D 1653 Method B, Condition A, - Test method to determine perm rating.
      b. D3960-93 - Practice for determining volatile organic compound content.

C. Qualifications: Installer specializing in the work of this Section with minimum three (3) years documented experience.

1.4 DELIVERY, STORAGE AND HANDLING

A. Delivery
   1. Schedule delivery of materials at the site at such time as required for proper coordination of the work. Receive materials in manufacturer's unopened packages and bearing manufacturer's label.

B. Storage:
   1. General: Store materials in a dry and properly ventilated separate structure not less than 50'-0" from any other structure on the site. Adequately protect from damage and exposure to the elements.
   2. Temperature: Maintain minimum of 45 degrees F and a maximum of 90 degrees F.
   3. Fire Prevention: Take necessary precautions to prevent fire; remove paint-soiled rags and waste from building each day or store in metal containers with covers in the paint storage structure.

1.5 PROJECT/SITE CONDITIONS

A. Contractor shall be responsible for repairing damaged masonry prior to application of anti-graffiti coating.

B. Repairs shall be made by qualified mechanics skilled in the type of repairs required, to the satisfaction of the owner's representative.

C. Cover air intakes, air conditioning vents and similar openings that may come in contact with the anti-graffiti coating and residues fumes. Leave covers in place until application of anti-graffiti coating is completed in the area.

D. Protect trees, plants, foliage, storm sewers, and surrounding surfaces from anti-graffiti coating.

E. Take appropriate precautions to avoid harm to building occupants, pedestrians and nearby property. Terminate work when wind drift may cause contact with passerby or vehicles and adjacent property.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Graffiti resistant coating unpainted stone:
   1. Manufacturers:
      a. Cathedral Stone, 7266 Park Circle Drive, Hanover, MA, 21076, Tel: 410-782-9150, www.cathedralstone.com
         1) R97 Water Repellent - two coats must be applied for product to perform as a graffiti resistant coating

b. Ecological Coating, PO Box 4202, Clifton Park, NY 12065, Tel: (518) 383-9585, www.ecologicalcoatings.com
   1) EC-1820 Waterborne Clear Anti-Graffiti Coating, Satin Finish
c. Or approved equal.
   1) Approved equal product must dry clear with no milky or cloudy appearance.
   2) Approved equal product permeability data must be provided to Engineer for review

2. Color: Clear

B. Graffiti resistant coating unpainted concrete:
1. Manufacturers:
   a. PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046. Phone: (800) 255-4255; Fax: (785) 830-9797. E-mail: CustomerCare@prosoco.
      1) Block-Guard & Graffiti Control Ultra
   b. Or approved equal.
      1) Approved equal product must dry clear with no milky or cloudy appearance.
      2) Approved equal product permeability data must be provided to Engineer for review
2. Color: Clear

C. Graffiti resistant coating for painted concrete walls:
1. Manufacturers:
   a. Ecological Coating, PO Box 4202, Clifton Park, NY 12065, Tel: (518) 383-9585, www.ecologicalcoatings.com
      1) EC-1700 Pigmented Anti-Graffiti Coating, Satin Finish
   b. Or approved equal.
2. Color: color is to be selected by Engineer from manufacturers' standard colors.

2.2 MIXING

A. General: Mix per manufacturers' instructions.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Product Handling:
1. Delivery: Schedule delivery of materials at the site at such time as required for proper coordination of the work. Receive materials in manufacturer's unopened packages and bearing manufacturer's label.
2. Storage: Store materials in a dry and well ventilated place, adequately protected from damage and exposure to the elements.

3.2 PREPARATION

A. Environmental Requirements: Do not apply when temperature is below 40 Degrees F.

B. Examination: Examine conditions of work in place before beginning work; report defects.

C. Storage:
   1. General: Store in properly ventilated separate structure not less than 50'-0" from any other structure on the site.
   2. Temperature: Maintain minimum of 45 degrees F and a maximum of 90 degrees F.
   3. Fire Prevention: Take necessary precautions to prevent fire; remove paint-soiled rags and waste each day or store in metal containers with covers in the storage structure.

D. Protection: Protect adjacent surfaces not scheduled for graffiti resistant finish from damage resulting from coating operations.

E. Surface Preparation: Prepare surfaces in strict compliance with manufacturer’s instructions.

3.3 INSTALLATION

A. General: Install in conformance with referenced standards, manufacturer's written directions, as shown, and as specified.

B. Graffiti Resistant Coating:
   1. General: Apply minimum two (2) coats; allow adequate drying time between coats.
   2. Dry Film Thickness: Minimum 1-2 mils per coat; minimum 3 mills for 2 coat application.

3.4 CLEANING

A. General: Keep premises free from accumulation of waste and rubbish. At the completion of work remove surplus materials, rubbish, and debris.

END OF SECTION

SECTION 10 10 10 - FALL PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes fall arrest systems. The Fall Arrest Systems shall allow the user to walk uninterrupted the entire length of the system and provide secure anchorage to arrest a fall by the users. All components shall be included, so as to provide a complete and fully operational system including a minimum of two safety harnesses.

B. The fall protection system shall be installed as not to interfere with facility appurtenances including, but not limited to, chimneys, ridges, eaves, vents, gutters or hatches. Careful coordination shall be employed during the installation and design of the fall protection system.

C. Interior fall protection system shall be ManSafe PushLock System, as provided by Latchways Fall Protection, or approved as equal.

1.3 REFERENCES

A. The publications listed below form a part of this section to the extent referenced:
1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
2. AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)
3. ANSI Z 359.1 American National Standard Safety - Requirements for Personal Fall Arrest Systems and Components
4. OCCUPATIONAL HEALTH AND SAFETY ADMINSTRATION (OSHA) - OSHA 1926.502 Fall Prevention Systems and Criteria and Practices

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 in sufficient detail to show full compliance with the specifications:

A. Pre-construction Submittals:
   1. Material, Equipment, and Fixture Lists shall be submitted for approval
   2. Product Data: Manufacturer's data and product information for manufactured materials and products. Manufacturer's Catalog Data indicating the sizes, descriptions, capacities, test certifications, and other descriptive data showing in sufficient detail that the product complies with the contract requirements shall be submitted.
   3. Equipment and Performance Data shall be submitted for approval:
      a. Stanchions
      b. Constant force anchorage posts
      c. Energy absorbing devices
      d. Body harnesses
      e. Cable
   4. Shop Drawings:
      a. For fabrication showing the complete fall protection system and indicate all roof appurtenances including, but not limited to, chimneys, ridges, eaves, vents, gutters or hatches.
      b. Layout drawings of each system in relation to the supporting structure indicating the locations of all components in the system properly labeled for identification. System Layout, Design Analysis, and Calculations prepared and certified by a Licensed Professional Engineer employed by the Fall Protection Contractor as a full time fall arrest systems designer.

B. Systems Manual: Contractor shall furnish a manual including the following:
   1. Maintenance Procedures: Including parts list and maintenance requirements for all equipment.
   2. Operation Procedures: Indicating proper use of equipment for safe operation of the systems.
   3. Test Certificate: Indicating completion of proof load testing on installed systems.
   4. Product Certificate: Containing the manufacturer's serial number, name and part number of each individual component used in the systems. Manufacturer's catalog data indicating the sizes, descriptions, capacities, test certifications, and other descriptive data showing sufficient detail that the product complies with the contract requirements shall be submitted for approval in accordance with Section 01330, "Submittals".
   5. As-Built Drawings: A copy of as-built drawings shall also be included in the systems manual.

C. Manufacturer's Instructions:
   1. Manufacturer's Instructions indicating the manufacturer's recommended method and sequence of installation shall be submitted for the following:
   2. Stanchions
   3. Constant force anchorage posts
   4. Energy absorbing devices
   5. Body harnesses
   6. Cable

1.5 DELIVERY STORAGE AND HANDLING

A. Deliver materials in manufacturer's original unopened packaging.

B. Store materials in original protective packaging at location specified. Prevent soiling, physical damage or wetting.

1.6 PROJECT CONDITIONS

A. Field Measurements: Perform prior to preparation of drawings to ensure required fit and dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Flexible Lifeline Systems
   1. 14325 West Hardy Road
   2. Houston, TX 77060
   3. PH: 800-778-9048/ 281-448-8821 Contact: Hugh Armstrong ext. 17
   4. FX: 281-448-9225
   5. Western Regional Office:
   6. PH: 253-835-3574
   7. FX: 253-815-7882

B. Approved Equal

2.2 MATERIALS

A. All materials shall be new, and completed Fall Protection System shall be the product of one manufacturer or the manufacture’s authorized installer regularly engaged in the design and production of such equipment.

B. Fall Arrest Systems and Components: All system connectors, cables and bolts shall be manufactured from stainless steel: ASTM A 666, Type 316. All connectors shall comply with OSHA regulation 1926.502. Fabricated supports required for additional support shall be carbon steel with a corrosion resistant finish.

C. Fasteners: The Fall Arrest Systems shall be attached to the supporting structure with appropriate fasteners. The fasteners shall be designed to support a load on the system of 2 times the maximum design load without failure.

2.3 FABRICATION

A. System components shall be of same material unless otherwise indicated.
   1. Exposed work shall be true to line and level with accurate angles, surfaces and with straight square edges. Coordinate anchorage system with supporting structure. Fabricate anchoring devices as recommended by the manufacturer to provide adequate support for intended use.
   2. Fabricate Joints in a manner to discourage water accumulation. Provide weep holes to drain any water, which could accumulate in the exposed joints.

2.4 SYSTEM DESIGN

A. The Fall Arrest Systems shall be designed to fully protect the user at all times while in the area of potential fall hazard. The Fall Arrest Systems shall be designed for 2 simultaneous users.

B. System Description:
   1. Horizontal Lifeline Cable: Marine grade stainless steel wire rope with a minimum breaking strength of 10,000 pounds.
   2. Constant Force Anchorage Posts: Designed to limit load to 10kN in the event of a fall and absorb the energy integrally. The body of the anchorage is to deploy in the event of a fall pulling the fixings in shear and preventing damage to the roof system. Weather proof construction and designed for attachment to all major composite, built-up on site, standing seam and single ply membrane roofing. Attached by means of stitching screws, spilt clamps and toggle bolts with no need for fixing to purlins or structural steel.
   3. Swaging: The cable shall be swaged in-line with the anchor point and have a slip indicator.
   4. Shock Absorber: Load limiting in-line shock absorber to 3,000 pounds for multispan systems and 4,500 pounds for single span systems. The shock absorber shall visually display deployment in the event a load such as a fall has occurred on the system.
   5. End Anchors: 316S stainless steel end anchors with minimum breaking strength of 10,000 pounds.
   6. Transfastener/Trolley: Provide 6 (six) 316S stainless steel with a minimum tensile load of 3600 pounds. The transfastener shall allow for easy pass-thru of support points without disconnecting from the system for both horizontal and inclined surfaces. In event of a fall on an inclined surface, the transfastener shall have the ability to lock onto the main cable (i.e. “rope grab”) without excessive slippage down the structure.
   7. Tension Indicator: The system shall include a tension indicator that will allow the user to physically inspect that the correct cable tension is achieved.
   8. Other Components: Corner Assemblies, Turnbuckles and other components shall be 316S stainless steel.
   9. Deceleration Device: Provide 6 appropriate length lanyards that meet or exceed applicable standards of ANSI Z 359.1 and OSHA 1926.104.

10. Harnesses: Provide 6 full body harnesses with single back D-ring that meet or exceed applicable standards of ANSI Z 359.1 and OSHA 1926.104.
11. Material Control: All system components shall contain serial numbers, permanently stamped or engraved, identifying the specific job and system they are used for. These serial numbers shall be recorded in the system manual as described in 1.3-3 and forwarded to the owner upon completion of the project.
12. Interior fall protection system shall have removable stainless steel eyebolt and permanently installed receiving insert. The removable eyebolt shall be capable of receiving standard harness clamps. Install inserts on each side of the overpass, spaced at 8 feet on centers max.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install according to the approved shop drawings and manufacturer's instructions.

B. Fall Protection Systems shall be installed by manufacturer's authorized, trained and certified personnel.

C. Install anchorage and fasteners in accordance with manufacturer's recommendations to obtain the allowable working loads published in the product literature and in accordance with this specification.

D. Do not load or stress Fall Arrest Systems until all materials and fasteners are properly installed and ready for service.

E. Install all Fall Arrest System components a minimum of 6 feet from the roof edge

F. Interior Fall Protection system shall be installed into existing concrete curbs found within the overpass. Drill and fasten anchors along the top surface of the curb, as per the manufacturer’s recommendations into cast-in-place concrete. Existing concrete shall be assumed to have a compressive strength of 4000 psi at 28 days.

3.2 OPERATOR TRAINING

A. Provide a minimum of 4 hours of operator training after system has been installed and proof tested. Training is to be for the users of the system conducted at the installation site.

3.3 CLEANING

A. Remove all loose materials, crating and packing materials from premises.

END OF SECTION

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Signage under this section is intended to include items for identification, direction, control and information of building, and to be installed as a complete integrated system.
   1. Wayfinding signs,
   2. All doors/entryways with room name and/or universal symbol,
   3. Wall mounted engraved directional and identification signs,
   4. Parking garage/parking lot directional signage,
   5. OSHA compliant equipment signage,
   6. Building identification signs, and
   7. Miscellaneous site signage.

1.2 RELATED DOCUMENTS

1. Section 05 50 10 Miscellaneous Metals
2. Section 10 82 11Stainless Steel Grating and Frames
3. Section 09 90 10 Painting and Finishing
4. Section 09 91 14 Preparation of Surfaces

1.3 REFERENCES

A. MTA Metro-North Signage Manual, Current Edition

B. MTA Metro-North Standard Signs for Parking Facilities, Current Edition
Comply with all applicable codes and regulations of governmental agencies having jurisdiction.
   1. American National Standards Institute (ANSI)

C. Industry Standards:
   1. Department of Justice, Office of the Attorney General, "Americans with Disabilities Act", Public Law 101-336 (ADA).
   2. ANSI A117.1: Providing Accessibility and Usability for Physically Handicap People, 1986 edition.
   3. Federal Register Part III, Department of Justice, Office of the Attorney General, 28 CFR Part 36: Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities, Final Rule, July 26, 1991.
   4. Federal Register Part II, Architectural and Transportation Barriers Compliance Board, 36 CFR Part 1191: Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Amendment to Final Guidelines, September 6, 1991.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Schedule system installations after related finishes have been completed, and in schedule with the project phased construction.

B. ADA design requirements:
   1. Signage requiring tactile graphics:
      a. Wall mounted signs designating permanent rooms and spaces, such as room numbers, restrooms, electrical closets, and mechanical rooms.
      b. Individually applied characters are prohibited.
   2. Signage not requiring tactile graphics but requiring compliance to other ADA requirements: All other signs providing direction to or information about function of space, such as directional signs (signs with arrow), informational signs (operating hours, policies, etc.), regulatory signs (no smoking, do not enter) and ceiling and projected wall mounted signs.

C. ADA performance requirements:
   1. Tactile graphics sign mounting requirements:
      a. Openings: Mount 60" to sign centerline above finished floor adjacent to opening.
      b. No wall space adjacent to latch side of door, opening or double doors: Mount 60" to centerline above finished floor on nearest adjacent wall.
      c. An interior sign plaque shall be installed adjacent to each new door. The final room description on each sign shall be determined by the Owner. A list generated from room names noted on drawings shall be submitted to the Owner for review and comment.

1.5 QUALITY ASSURANCE

A. Manufacturer qualifications: Work under this section from manufacturers regularly engaged in work of this magnitude and scope with documented experience on projects of similar size and scope.

B. Pre-installation conference: Closely coordinate tolerances required in this section for completely coordinated and smooth installation.

C. Installer must be regularly engaged in work of this magnitude and scope with a documented successful history installing work of this section.

D. All work shall conform to applicable codes.

E. Deliver all signs in fiber board foam, packed and protected for timely installation, minimizing on-site storage time.

F. Sign design builder to store all signs in a secured area, out of weather and protected, during installation.

G. Metro-North reserves the right to retain an independent testing service to inspect the manufacturing process to ensure conformity with the Contract Documents.

H. The Design-Builder shall provide an eighteen-month guarantee of all of the variable-message signs against any defects in workmanship or design. The Design Builder shall be responsible for supplying replacement parts, on a one- for-one no charge basis, to Metro-North for installation for any defective components that fail.

1.6 SUBMITTALS

A. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
   1. Recycled Content:
      a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
      b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
      c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
      d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.
   2. Local/Regional Materials:
      a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
      b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
      c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
      d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

B. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.

C. Operating And Maintenance Manuals Submittals:

D. Verify that plastic products to be incorporated into the Project are labeled in accordance with ASTM D1972. Where products are not labeled, provide product data indicating polymeric information in Operation and Maintenance Manual.
   1. Type 1: Polyethylene Terephthalate (PET, PETE).
   2. Type 2: High Density Polyethylene (HDPE).
   3. Type 3: Vinyl (Polyvinyl Chloride or PVC).
   4. Type 4: Low Density Polyethylene (LDPE).
   5. Type 5: Polypropylene (PP).
   6. Type 6: Polystyrene (PS).
   7. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above or is made of more than one resin listed above, and used in a multi-layer combination.
   8. Sign listing and schedule, lettering and locations, and overall dimensions of each sign.

E. Shop drawings indicating size, materials and method of attachment to door and/or wall or suspension method. Typography sample for message strips and header copy and any artwork for special graphics. Provide details of all sign types and plans locating each type of sign, detailing quantity, for submission for approval by Metro-North.

F. A schedule of completion and sequence of delivery of the work to be furnished and installed under this Section. This schedule shall include at least:

1. Preparation of Shop Drawings and Metro-North's review period for approval.
2. Prototype construction, review, final approval, manufacture and sequence of delivery

G. Sample of each sign type, in color specified. Samples will not be returned. Submit color samples as required by the Engineer.

H. Contract Close Out
1. Furnish appropriate checklist for aiding in reordering after Date of Substantial Completion. Maintain computer schedule program for ordering new signage as required by Owner.
2. Provide an 8½" x 11" re-order form for each sign type and component of each sign type. Forms must be keyed to sign type shown in bid documents using same sign type number.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
1. Schedule delivery of materials at the site at such time as required for proper coordination of the work. Receive materials in manufacture's unopened packages and bearing manufacturer's label.

B. Storage and Handling:
1. Store materials in a dry and well ventilated place, adequately protected from damage and exposure to the elements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Beyond Signs, Inc.

B. Kaltech Industries Group Inc., New York, NY

C. Nova Polymers

D. Steel Art Company

E. North Shore Neon Sign Co.

F. Signal-Tech

G. Approved equal.

2.2 SIGNS

A. General / Room Identification Signage: As approved by MTA Metro-North
1. Type: Hot stamped letters and numbers on matte finish plexiglass plaque with square corners.
2. Letter Style: "Helvetica" (generic) caps and lowercase.
3. Lettering shall be engraved through face to expose core.

4. Copy Size for Room Numbers: "Helvetica" medium, 1-1/2 inches high, flush left.
5. Copy Size for Room Name: "Helvetica" regular, ½ inch high, flush left.
6. Room Identification Plaque Size: 6 inch x 6 inch x 1/8 inch thick.
7. Background Color: Black matte.
8. Tactile Copy and Grade II Braille are to be precision embossed and raised a minimum of 1/32" and formed as an integral part of the sign face. Braille is to be the same color as the sign background with no interruption of the smooth, clean surface of the sign. All plaque edges to be clean, smooth, and free of all saw and tooth marks, and painted to match the background color of the sign. ADA compliant fabrication is required for all signs. Phenolic photopolymer and surface applied glued on letters will NOT be accepted. Lettering, Braille and symbols to be raised 1/32". Braille cell to be 1/4", character height to be 5/8" min., 2" max. Interline spacing to be half of cap height. Braille cell to be 1/4" min. below line of copy above.

B. Wayfinding Signage: Provide wall mounted wayfinding or informational signage with lettering as noted above. Sign to consist of matte finish Plexiglas panel 11”x6”. Lettering style shall be the same as listed above, in general signs.

C. ADA Ramp Signage: Provide wall mounted directional signage at top and bottom of stairway with ¾” high lettering as noted above. Sign to consist of matte finish Plexiglas panel 7”x9”. Lettering style shall be the same as listed above, in general signs, with stair symbol above.

D. Elevator Signage: Provide wall mounted informational signage at all levels of elevator with 5/8” high lettering as noted above. Sign to consist of matte finish Plexiglas panel 9”x8”. Lettering style shall be the same as listed above, in general signs.

E. Canopy Glass Panel Distraction Marks: Provide vinyl window film as indicated on Drawings at all full height glass panel windows and doors. Film to have the appearance of frosted glazing.

F. No Smoking: Provide wall mounted signage with tactile No Smoking symbol as noted above. Sign to consist of matte finish Plexiglas panel 6”x6”. Grade II Braille copy to be the same as listed above, in general signs.

G. All other signage per MTA Metro-North Standard Signs for Station Facilities in type and quantity required to create a complete signage and wayfinding package for approval by Metro-North. Package will include signage above, as well as, but not limited, to the following:
1. Trailblazing Sign at each station entry/exit
2. Station Facility Entrance Signs
3. Station Directions sign
4. ADA Ramp Signage
5. Additional Wayfinding Signage directing passengers to the elevator/ ADA Accessible Path into and out of the station

2.3 MATERIALS

A. Plastic Signs and supports:
1. Recycled Content: Minimum 80 percent post-consumer recycled content.

B. Aluminum Signs:
1. Recycled Content: Minimum 25 percent post-consumer recycled content.

C. Steel posts and/or supports:
   1. Recycled Content: Minimum 16 percent post-consumer recycled content.

2.4 EXECUTION

A. Station Signs: As shown on drawings and approved by Metro-North.

B. Supply and install all required conduit, wiring for power, and pull lines for communication connections for the signage listed in this Section. All communication wire and final connection of communication shall be installed and executed by Metro-North.

2.5 OTHER MATERIALS

A. All materials, including those not specifically described, but required for a complete and proper installation, shall be new, first quality of their respective kinds.

2.6 FABRICATION

A. Shop Assembly:
   1. Fabricate units to configurations indicated on reviewed shop drawings. Internally reinforce units in accord with reviewed shop drawings.
   2. Provide copy required on inserts, message strips, headers or bases and covers required on reviewed shop drawings and in accord with ADA requirements.
   3. Fill directories with combination of reviewed copy on message strips on blank message strips.
   4. Wrap each individual unit with clear polyethylene (see-through) pack and ship by floor in numerical order, tagged sequentially to message schedule.
   5. A final copy of the message schedule is to be provided to the client for their review and approval prior to any fabrication.

PART 3 - EXECUTION

3.1 PREPARATION

A. Transmit submittals required by this Section.

B. Furnish products as indicated.

C. Ensure that substrates are in suitable condition to receive the work.

3.2 INSPECTION

A. Examine surfaces scheduled to receive signage units for unevenness, irregularities that would affect quality and execution of work.

B. Approved List: Proceed only with final approved submittals based on assigned identifications reviewed by the Engineer and Owner.

3.3 INSTALLATION

A. Install work in strict accordance with manufacturer's recommendations.

B. Locate signs in a straight and aligned manner using manufactured adhesive and/or fastening methods.

C. Contact the Engineer if there are any questions as to suitability of the installation location or installation surface.

D. Conform to ADA requirements for tactile graphics signage.

3.4 CLEANING

A. Clean exposed surfaces using non-abrasive cleaning agents such as soap and water or as recommended by manufacturer not more than 48 hours prior to date of Substantial Completion in accord with manufacturer’s written cleaning instructions.

B. Maintain signs according to maintenance instructions as provided by the manufacturer.

END OF SECTION

SECTION 10 82 11 - STAINLESS STEEL GRATING AND FRAMES

PART 1 - GENERAL REQUIREMENTS

1.1 Summary

A. The Contractor shall furnish all labor, materials, tools and equipment necessary for the stainless steel grating as indicated on the Contract Drawings and as specified herein, and as directed by the Engineer for Scarsdale and Hartsdale stations.

1.2 Related Documents

A. SECTION 05 50 10 Miscellaneous Metals

B. SECTION 08 90 00 Louvers and Vents

C. SECTION 14 24 23 Hydraulic Passenger Elevators

1.3 QUALITY ASSURANCE

A. Statement of Application shall be provided by the Contractor in accordance with this Section.

B. Integrated dashboard wall grating and accessories by a single manufacturer.

C. Every panel of grating shall be subject to the Engineer's acceptance, and any panels, which may be rejected after having been set shall be carefully cut out and replaced with new suitable ones without delay, and without any additional cost to the Owner.
   1. Engineer's inspection of the panels does not relieve the Contractor for this work from his responsibility to provide all work in accordance with the approved samples and shop drawings.

D. Subcontract fabrication and installation of grating to a firm or firms, which have successfully fabricated and/or installed grating similar to the quality specified and in the quantity shown for a period of not less than five (5) years.

E. Examination Criteria: All examinations, selections, and acceptances shall be for the purpose of achieving a final appearance of grating with the greatest possible uniformity, and will be based upon the following criteria:
   1. Panels shall align.
   2. Conformance to approved shop drawings and details within specified dimensions and tolerances.

F. Standards:
   1. ASTM A-276 Standard Specification for Stainless and Heat-Resisting Bars and Shapes.

G. General:
   1. Comply with all applicable codes and standards.

2. Sizes, gauges and finishes listed herein are to be considered minimum and not relieve Contractor from providing grating to meet all performative and regulatory requirements.

1.4 TOLERANCES

A. Conform to the following
   1. Joints: -0", +1/16".

B. Panels: Dimension tolerance shall be +0", -1/16" in both directions, with ninety (90) degree angle for all corners.

C. Panel face dimension tolerance (flatness) shall be + 1/32" in all directions.

1.5 SUBMITTALS

A. Shop Drawings: Submit complete setting drawings showing shop sizes, shapes, anchors and accessories, jointing, connection with other work, typical and special details, dimensions and setting numbers. Do not fabricate any panels (except for samples) until shop drawings have been reviewed by the Engineer.

B. Fabricator's Data
   1. Submit copies of fabricator's specifications and installation instructions. Include data substantiating that materials comply with specified requirements. Indicate that Installer has received a copy of the fabricator's instructions.
   2. Fabricator's instructions for handling and storage at job site; installation and protection. Indicate that the Installer of grating work has received a copy of each instruction.

C. Testing Results
   1. Submit copies of certified testing laboratories results confirming performance criteria as listed in check section

D. Samples
   1. Grating: Submit one (1) set

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect panels during transit, storage and handling to prevent moisture, soiling, staining and physical damage.

B. Handle panels to prevent breakage, soiling or other damage.

C. Store panels on wood pallets, covered with non-staining, waterproof membrane. Protect stored panels from weather.

1.7 JOB CONDITIONS

A. Installer must review installation procedures and coordination with other work, with Contractor and other subcontractors whose work will be affected by grating work.

B. Field Measurements: Check actual block out openings in floors by accurate field measurements before fabrication of grates; show recorded measurements in final shop drawings.

1.8 PROTECTION

A. Protect adjacent surfaces from damage. Protect exposed surfaces of grating from damage or defacement.

B. After installation, protect grating flooring from damage during subsequent construction activities.

1.9 EXTRA STOCK

A. Provide "extra stock" of the grating equal to not less than five (5) percent of the quantity of tiles installed. Extra stock shall include trim units of the same percentages.

B. Deliver "extra stock" in original shipping containers/cartons, clearly marked or otherwise identified with the manufacturers labels describing contents. Deliver extra stock to a nearby location determined and as directed by the Metro North.

1.10 WARRANTY

A. The Contractor, by commencing the work of this Section, assumes overall responsibility, as part of his warranty of the work, to assure that all assemblies, components, and parts shown or required within the work of this Section, comply with the Contract Documents. The Contractor shall further warrant:
   1. That all components, specified or required to satisfactorily complete the installation, are compatible with each other and with the conditions of installation and expected use.
   2. The overall effective integration and correctness of individual parts and the whole of the system.
   3. Compatibility with adjoining substrates, materials and work by other trades.
   4. There shall be no material failure due to improper design and fabrication of the grating. All materials are to fully perform to their normal life expectancy. Manufacturer shall offer a five (5) year warranty against defects in materials and workmanship.

PART 2 - PRODUCTS AND MATERIALS

2.1 GRATING ASSEMBLY

A. Stainless Steel: Type 316

B. Finish: #4 Satin.

C. Grating Panel Size: As indicated in the Contract Documents.

D. Hidden Locking Devices: Stainless steel. Shall be used to prevent warping and rattling. The number of lockdowns to be used shall be in accordance with the manufacturer’s recommendations.

E. Supports: Stainless steel angles of size required to meet floor slab or face of metal panel partition of integrated dashboard wall
   1. Intermediate supports spaced no greater than 2’ apart.

F. Shims and Anchors: Stainless steel.

2.2 ACCESSORY MATERIALS FOR GRATING
   1. Framing
   2. Mechanical stainless steel fixings in vertical application

PART 3 - EXECUTION

3.1 INSPECTION
   1. Examine the areas and conditions where grating is to be installed and notify engineer of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 TOLERANCES

A. Allowable Variations in Finished Work: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes and alignment shown.
   1. Floors: 1/16" in 10'-0" run, any direction; + 1/16" at any location; 1/32" off-set at any location.

3.3 INSTALLATION

A. Coordinate for co-planar installation of grate surface to surrounding finishes

3.4 REPAIR AND CLEANING (AFTER INSTALLATION)

A. Remove and replace panels which are broken, stained or otherwise damaged. Where directed, remove and replace panels which do not match adjoining panels.

B. Clean all grating with warm water and mild detergent.

3.5 PROTECTION

A. After installation and cleaning, protect grating from damage during subsequent construction activities.

B. Provide temporary cover of plywood until construction traffic has ended.

END OF SECTION

SECTION 13 28 16 - SAFETY NETTING

PART 1 - GENERAL

1.1 SUMMARY

A. Installation of safety netting, debris netting, and netting accessories as specified herein and on the contract drawings.

1.2 SUBMITTALS

A. The Contractor shall submit the following information in accordance with the General Provisions:

B. Product Data:
   1. Provide Manufacturers' product literature for materials specified and material Manufacturer's printed directions and recommendations for installation.

C. Samples:
   1. Initial Selection: Submit Manufacturer's colors for approval by the Engineer.
   2. Verification prior to installation.
      a. When required by Engineer, submit sample of each item fastened on a 12" x 12" hardboard.
   3. All samples shall be labeled; and include the following information:
      a. Manufacturer's name.
      b. Model Type.
      c. Manufacturer's stock number.
      d. Color for netting: refer to Architectural Drawing Finish Schedule
      e. Instructions for installation.

D. All submittals shall comply with the requirements of the General Provisions.

E. Submit for approval shop drawings of safety netting and debris netting and all attachment details.

F. Delegated-Design Submittal: For netting systems and attachments to structure, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Qualified professional engineer shall be licensed in the state of New York.

G. Testing data for netting and netting accessories

H. Flame retardant documentation

I. Maintenance data

1.3 QUALITY ASSURANCE

A. General: Refer to Division 1 Quality assurance

B. Reference standards:
   1. General: Refer to Division 1 Reference standards.

C. Obtain all installation information from Manufacturer.

D. Use workers completely familiar with safety and debris netting installations.

E. Installer Qualifications: Installer of netting is a certified installer with documented history installing manufacturer's products according to manufacturer's specifications.

F. Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

G. Delegated design: Qualified professional engineer shall be licensed in the state of New York.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect netting and netting accessories from damage before and during installation.

B. Store materials on a clean, dry surface or platform, off ground, covered, separate from each other and protected from deterioration and the elements. Bear fully along all supported edges on level and true structural supports.

C. During freezing weather protect materials with tarpaulins or other suitable material.

D. Handle all materials in a manner which will prevent undue stress on component parts, sealants and structural members. Do not rack, torque, or cause load forces in an inappropriate manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Manufacturers:
   1. Basis of Design: InCord, 226 Upton Road, Colchester, CT 06415, Ph: 800-596-1066
   2. US Netting, 1514 Veshecco Drive, Erie, PA, 16501, Ph: 800-331-2973
   3. Engineer's approved equal.

B. Products:
   1. Personnel Safety Netting:
      1) Basis of Design Model: N820H FR NTPP Knotless, InCord

2) Construction: Raschel Knotless Netting
3) Fiber: High tenacity polypropylene, in compliance with ANSI A10.11-1989
4) Mesh size: 2-1/2-inch
5) Cord Diameter: 3/16-inch
6) Weight: 0.0528 lb/ft squared
7) Mesh Break: 719 lbf
8) Melting Point: 320 degrees F
9) UV Rating: 300 kLy
10) Dynamic Drop Test: 12,075 ft-lb
11) Fire Retardant: NFPA-701 Method 1 and DIN 4102 (B1)
12) Border: 1-inch folded nylon webbing
13) Color: Black

2. Debris Netting:
   a. Basis of Design Model: WS70 Wind Screen, InCord
      1) Construction: Raschel Knit
      2) Fiber: High density polyethylene
      3) Mesh size: 1/8-inch
      4) Light Block: 70%
      5) Weight: 4.4 oz/square yard
      6) Air Permeability: > 1490 CFM / ft squared per ASTM D 737-96
      7) Breaking Strength: MD : 73.50; CMD: 94.15; per ASTM 5035.06
      8) Bursting Strength: 160 lbf/in squared per ASTM D 3786-08
      9) Foot Pound Capacity: 400 lb (tarp configuration)
      10) Flame Retardant: NFPA-701 Method 2
      11) Border: 1-1/2-inch folded polypropylene webbing
      12) Color: black

C. Mounting systems
   1. Tamper resistant, stainless steel fasteners and hardware as specified by the Manufacturer and engineer of record responsible for delegated design.

D. Access zipper
   1. Allows for access to areas behind the netting installation. Heavy duty, marine-grade, black Net Zipper with 3/4” fabric tape, open top and auto lock slider.
   2. See drawings for size and location

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine work area; note any detrimental conditions that would interfere with proper installation of the bird control.

B. Do not proceed until conditions are corrected.

C. By beginning installation of netting, contractor is indicating his acceptance of the condition of the work area.

3.2 SURFACE PREPARATION

A. Clean Surface thoroughly before beginning installation. In all installations, the area must be prepared - with the removal of any and all bird droppings, debris, dirt and other foreign matter and the area must be clean of grease, salt and film, loose (flaking) paint, etc.

3.3 INSTALLATION

A. Install in accordance with Manufacturers installation instructions.

B. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections and discipline. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

3.4 INSPECTION

A. Visually inspect netting for debris. Inspect mounting systems.

B. Repair as necessary immediately.

END OF SECTION

SECTION 14 24 00

TABLE OF CONTENTS

SECTION 14 24 00
HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Hydraulic elevators as follows:
   1. Two passenger elevators, Cars located at the Hartsdale Station (E1 and W1).

B. Related Requirements:
   1. Division 01 Section – General Requirements
   2. Division 03 Section – Concrete
   3. Division 04 Section – Masonry
   4. Division 05 Section – Metals
   5. Division 06 Section – Wood, Plastics and Composites
   6. Division 09 Section – Finishes
   7. Division 22 Section – Plumbing
   8. Division 23 Section – Heating, Ventilating and Air Conditioning (HVAC)
   9. Division 26 Section – Electrical
   10. Division 27 Section – Communications
   11. Division 28 Section – Fire Alarm Systems

1.2 ALLOWANCE

A. Elevator Car Allowances: Provide finished passenger elevator cars under the elevator car allowance which includes furnishing and installing the following:
   1. Car wall finishes including trim.
   2. Car ceiling finishes including lighting, wring, and coordination of battery-operated emergency lighting.
   3. Car door finishes.
   4. Car light fixtures.
   5. Handrails.
   6. Cutouts and other provisions for installing elevator signal equipment in cars.
   7. Mounting for protective pads

1.3 DEFINITIONS

A. Terms used are defined in the latest edition of the Safety Code for Elevators and Escalators, ASME A17.1.

1.4 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44 (2013)

B. Accessibility Requirements: Comply with 2010 ADA standards for Accessible Design and with ICC A117.1. Comply with Uniform Federal Accessibility Standard, UFAS.
   1. The term “withstand” means the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event.
   2. Project Seismic Design Category: B.

3. Elevator Component Importance Factor (Ip): 1.0
4. Design Spectral Response Acceleration (SDS): 0.289

1.5 SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures, hoistway entrances, and operation, control, and signal systems. Include product data for signal fixtures, lights, graphics, Braille plates, and details of mounting provisions.

B. Shop Drawings:
1. Include plans, elevations, sections, and large-scale details indicating openings at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment.
2. Include large-scale layout of car operating panel.
3. Indicate maximum dynamic and static loads imposed on building structure at points of support and maximum and average power demands.
4. Power Confirmation Information: Include motor horsepower, code letter, starting current, full - load running current, and demand factor. Provide engineered power consumption estimates based on 120 starts per hour.

C. Samples for Initial Selection: For finishes involving surface treatment, paint or color selection.

D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes:
1. Samples of sheet materials: 3" (75 mm) square.
2. Running trim members: 4" (100 mm) lengths.

E. Operation and Maintenance Data:
1. For elevators to include in emergency, operation, and maintenance manuals.
2. In addition to items specified in Division 01 Section “General Requirements” include diagnostic and repair information available to manufacturer’s and Installer’s maintenance personnel.

F. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

1.6 QUALITY ASSURANCE

A. Compliance with Regulatory Agencies: Comply with most stringent applicable provisions of following codes, laws, and/or authorities, including revisions and changes in effect:
1. New York State Building Code (IBC 2015) w/2017 Supplements
2. Safety Code for Elevators and Escalators, ASME A17.1 (2013)
3. Guide for Inspection of Elevators, Escalators, and Moving Walks, ASME A17.2
4. Elevator and Escalator Electrical Equipment, ASME A17.5
5. National Electrical Code, NFPA 70 (2017)
6. New York State - American with Disabilities Act (2010)
7. New York State Fire Code (2018) [IFC 2015]

8. Requirements of most stringent provision of local authority having jurisdiction.
9. Life Safety Code, NFPA101

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver material in Contractor's original unopened protective packaging.

B. Store material in original protective packaging. Prevent soiling, physical damage, or moisture damage.

C. Protect equipment and exposed finishes from damage and stains during transportation and construction.

1.8 OPERATING AND MAINTENANCE MANUALS

A. Maintenance Manuals: Prior to installation, Elevator Contractor shall submit two (2) complete sets of operation and maintenance manuals for approval. After Metro North Railroad approval and prior to the beginning of acceptance testing, four (4) sets of the approved manuals shall be provided by the Elevator Contractor.

1.9 TRAINING OF OWNER'S PERSONNEL

A. The Contractor shall train the owner's personnel in maintenance.

B. Training shall be given by personnel qualified, in the care, adjustment and operation of the elevator system.

C. Training shall include, but not be limited to, the car, adjustment, operation and sequence function of the operation and control systems.

D. Training shall be given during normal working hours of normal working days. The training period shall be assumed to be four-hours.
   1. The owner shall also have the option to assign personnel to observe and be retrained during the final tuning and adjusting of the elevator.
   2. Five copies of the operating and maintenance manuals shall be prepared by the Contractor and shall be utilized by the Contractor for instruction purposes.
      a. After completion of all instructions, the five copies of the complete manual shall be turned over to the owner.
      b. The time and place of the instructions shall be coordinated with the owner.

E. Training shall also include but not be limited to the following:
   1. Operation of elevator under emergency condition.
   2. Operation and maintenance of the elevator Fire Fighters' system.
   3. Safety procedures in gaining access to elevator pit.
   4. Safety procedures in gaining access to elevator hoistway.
   5. Safety procedure in removing passengers from stalled elevator.
   6. Operation of top of car operating station, elevator communication, safety edge, pit stop switch, leveling device, etc.

1.10 WARRANTY

A. Provide project warranty effective for one (1) year from the final acceptance of the elevator, which shall be signed by Contractor, Installer and Manufacturer, agreeing to replace/repair/restore defective materials and workmanship of elevator during warranty period.
   1. "Defective" is hereby defined to include, but is not limited to: operation or control system failures, excessive wear, excessive malfunctions, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and unusual, unexpected and unsatisfactory conditions.

B. After the one (1) year Warranty Period concludes there shall be an additional 30 day trouble free period. If any elevator outages or unscheduled repairs are performed during this period, not including those due to vandalism of force majeure, then the Warranty period is extended for an additional 30 days.

C. The Contractor shall warrant to the owner that all work furnished under this contract shall be:
   1. Free from defects in design, material, and workmanship.
   2. Adequate and suitable for any use and purpose specified or referred to in this contract.
   3. Suitable for any other use or purpose as represented in writing by the Contractor.
   4. In conformance with the drawings, specifications and design criteria supplied to the Contractor by the Engineer.

1.11 MAINTENANCE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months full maintenance by skilled employees of elevator Installer under the supervision and in the direct employ of the Contractor. Include bi-weekly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Repair or replace any parts of equipment whenever required during the maintenance period and use only genuine standard parts produced by the manufacturer of the equipment installed.

B. After the 12 month Maintenance Period there shall be an additional 30 day trouble free period. If any elevator outages or unscheduled repairs are performed during this period, not including those due to vandalism of force majeure, then the Maintenance period is extended for an additional 30 days.

C. All normal work, including regular examination and scheduled repair in accordance with this contract, is to be made during the regular business hours of the Contractor.

D. Contractor shall perform the required mandated inspections and tests as required per local jurisdictions during the term of the included one (1) year maintenance contract.

E. The piston packing seal should be changed at the following intervals:
   1. Prior to putting the cab into service under beneficial use;
   2. After the 12 month warranty period.

F. Bi-weekly systematic examination, adjustments, cleaning and lubrication of all machinery, machinery space, hoistway and pit. The Contractor shall maintain all parts of the elevator,

consisting of, but not limited to machine, motor, controller, selector, pump unit, piston cylinder assembly, valve unit, bearing, winding, rotating element, contact, coil, resistance for operating and motor circuit, leveling device, cam, hoistway door, track and guide, door operating device and door motor, car light, push button, indicator, car lantern and all other elevator signal scheduling and accessory equipment complete.

1. Lubrication: Lubricate bi-weekly (26 times per year at regularly scheduled intervals) all of those mechanical parts recommended to be lubricated by manufacturer of the equipment, or to otherwise lubricate as often as and in the manner specified by said manufacturer.
2. Lubricant and Cleaning: Lubricant shall consist of oil, grease and compound furnished by Contractor, and shall be of the highest quality, the consistencies of which shall be proper for the purposes employed and for the part to which applied. Contractor shall keep guide rails clean. When necessary, the Contractor shall renew guide shoe as required to ensure smooth and quiet operation. All oil reservoirs shall be kept properly sealed to prevent leakage. Approved metal containers shall be provided by the Contractor for the storage of wiping cloths.
3. Cleaning Materials: Cleaning compounds, waste, cloths and other materials are to be supplied by Contractor, it being understood and agreed that cleaning agent employed shall not be flammable or noxious, and must always be stored in approved metal container provided by the Contractor.
4. Cleaning: Contractor shall, remove and discard immediately, all accumulated dirt and debris from the pit areas. Prior to beneficial use and immediately before the end of the Maintenance Period the Contractor shall thoroughly clean down the entire hoistway of all accumulated dirt, grease, dust and debris.
5. Testing: Examine quarterly all safety device including governor, safety, piston cylinder assembly, and conduct annual no load test, annual inspection in accordance with ASME A17.1 and A17.2.
6. Wiring: Repairing and/or replacing all electrical wiring and conductor extending to the elevator from main line switch in the machine room and outlet in the hoistway. The fuses of the main line switch shall be maintained and replaced.
7. Keeping the exterior of the machinery and any other part of the equipment subject to rust, properly painted, identified and presentable at all times. Motor winding and controller coil are to be periodically treated with proper insulating compound.
8. Hydraulic system of pump unit, valve unit, and piston cylinder assembly: Examine and repair as required to maintain in smooth operating condition without any oil leak.

G. Full protective maintenance requirements:

1. Regularly and systematically examine, adjust, lubricate, clean and when conditions warrant repair or replace the following items and all other mechanical or electrical equipment.
2. Hydraulic power unit and accessories: pump, motor, valves, operating valves, pulleys, drive belts, flexible hydraulic hose and fitting assemblies, oil tank, muffler, strainer, sound isolating coupling, plunger, packing gland, scavenger system, piping and other components.
3. Cylinder piston assembly.
4. Controller, Selector and Dispatching Equipment: all components including all relays, solid state components, resistors, condensers, transformers, contacts, leads, dashpots, computer devices, selector switches, mechanical or electrical driving equipment, coils, magnet frames, contact switch assemblies, springs, solenoids, resistance grids, hoistway vanes, magnets and inductors.

5. Hoistway door interlocks or locks and contacts, hoistway door hangers and tracks, bottom door gibs, cams, rollers, and auxiliary door closing devices for power operated doors. Chains, tracks, cams, interlocks, sheaves for vertical bi-folding doors.
6. Hoistway limit switches, slowdown switches, leveling switches and associated cams, vanes, and electronic components.
7. Cab door operator and car door control, door protective device, car frame, car safety mechanism, governor, cable rope, platform, platform flooring, elevator car guide shoes including rollers or replaceable gibs, etc.
8. Car guide rails, top and bottom limit switches.
9. Hoistway door interlocks, track, roller, drive block, door gib etc.
10. All car and hoistway operating fixtures including Main Lobby fixtures, main car operating panels, safety edge, and starter's panels.
11. Automatic power operated door operators, door protective devices, car door hangers, tracks and car door contacts for both side slide and vertical bi-folding doors.
12. Traveling cables.
13. Elevator control wiring in hoistway and machine room.
14. Car safety mechanism and load weighing equipment.
15. Buffers.
16. Fixture contacts, push-buttons, key switches, locks, lamps and sockets of button stations (car and corridor), corridor lanterns, position indicators (car and corridor), direction indicators.
17. The guide rails shall be kept free of rust. Where roller guides are used, rails shall be kept dry and properly lubricated when sliding guides are used. Renew guide shoe rollers and gibs as required to insure smooth and satisfactory operation.
18. Examine, and make necessary adjustments or repair to the following accessory equipment including relamping of signal equipment: corridor lanterns, car and corridor position indicators, car stations, traffic director station, electric door operators, interlocks, door hangers, safety edge, and intercom systems.
19. The Contractor shall check the group dispatching systems (if applicable) and make necessary tests to insure that all circuits and time settings are properly adjusted, and that the system performs as designed and installed.

H. Contractor shall, at all times during the term of this Agreement, maintain locally an adequate supply of replacement parts in order to perform his obligations pursuant to the terms of this Agreement without any delay whatsoever.
1. The following spare parts shall be provided and kept on-site in a parts cabinet provided by the Contractor. All spare components shall be replenished as required.
   a. Ten (10) gallons of hydraulic oil in two (2) - 5 gallon sealed pails
   b. One (1) solenoid valve coil
   c. One (1) roller guide
   d. Two (2) door operator belts
   e. Two (2) sets of release rollers
   f. Two (2) hanger rollers
   g. Two (2) door gibs
   h. Spare cable for infra-red detector
   i. Two (2) pushbutton units
   j. One (1) gate switch contact
   k. One (1) door interlock contact

I. The Contractor shall keep the elevator maintained to operate at the original contract speed, keeping the original performance time, including acceleration and retardation as designed and

installed by the manufacturer. The door operation shall be adjusted as required to maintain the original door opening and door closing times, within legal limits.

J. Metro-North reserves the right to make inspections and tests as and when deemed advisable. If it is found that the elevator and associated equipment are deficient either electrically or mechanically, the Contractor will be notified of these deficiencies in writing, and it shall be his responsibility to make the necessary corrections within 30 days after his receipt of such notice.

K. Approximately six months prior to the end of the contract term, Metro-North may make a thorough maintenance inspection of the elevators covered under the contract. At the conclusion of this inspection, Metro-North may give the Contractor written notice of any deficiencies found. The Contractor shall be responsible for correction of these deficiencies within 30 days after receipt of such notice.

L. Metro-North reserves the right to accept or reject any or all alternates.

M. A complete permanent record of inspections, maintenance, lubrication and callback service for the elevator under service shall be maintained by the contractor in a location determined by the owner. These records are to be available to owner at all times. The records shall indicate the reason the mechanic was in the building, arrival and departure time, the work performed, etc. In addition, a chronological record of all work performed shall be kept in each machine room. Signed work tickets shall also be provided.

N. Contractor shall maintain a complete set of updated electrical wiring diagrams and drawings for the elevator on file with owner and these to become the property of the owner.

O. Contractor shall be responsible to re-lamp all lighting fixtures in the pit, machine room and hoistway as required.

P. Sole Responsibility: The maintenance work shall be performed by only the elevator men directly employed and supervised by the Contractor, who are experienced and skilled in maintaining and shall not be assigned or transferred to any agent or subcontractor.

1.12 EMERGENCY CALL BACK

A. Emergency Callback Service: Provide emergency callback service which consists of promptly dispatching qualified employees in response to requests from the Owner by telephone or otherwise, for emergency callback service on any day of the week, at any hour, day or night, 24-hour-per-day, 7-day-per-week during the Warranty and Maintenance periods.

B. Emergency repair shall be made to restore the equipment to operating order. If repair cannot be made immediately, the mechanic shall notify the Owner or his designated representative as to the reason why.

C. Response time for emergency callback service shall not exceed one (1) hour when the Contractor is advised that a trapped passenger is involved, and two (2) hours when an elevator malfunction occurs which does not involve a trapped passenger.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide borehole hydraulic passenger elevators or comparable product by one of the following:

1. Berringer Elevator Co.
2. Canton Elevator Inc.
3. Elevator Equipment Corporation
4. Elevator Systems (ESI) – Elevator Controller
5. Galaxy – Elevator Controller
6. Leistritz Elevator Corp.
7. Minnesota Elevator, Inc.
8. Monitor Elevator Products
9. Otis Elevator Company
10. Schindler Elevator Corporation
11. Thyssenkrupp Elevator

2.2 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Passenger Elevators Description:
Elevator Identification: Cars E1 & W1
1. Capacity: 4,000 lbs.
2. Class of Loading: Class A
3. Contract Speed: 125 fpm
4. Machine: Submersible Hydraulic pump
5. Machine Location: Adjacent
6. Operational Control: Single automatic, Collective Microprocessor-Based System
7. Motor Control: Single speed AC with SCR soft start with closed transition
8. Power Characteristics: 208 Volts, 3 Phase, 60 Hertz
9. Stops and Openings: E1: 3/3 – 1 Front; 2 Side; W1: 3/3 - 1 Front, 2 Rear
10. Floors Served: Street Level, Platform Level, Overpass Level
11. Travel: E1 & W1: 15'-2" ±
12. Platform Size: E1: 7'-0" wide x 7'-4 1/2" deep Cornerpost; W1: 7'-10" wide X 7'-4" deep
13. Minimum Clear Inside Car: E1: 6'-0" wide x 6'-4 1/2" deep; W1: 7'-0" wide x 6'-0" deep;
14. Entrance Size: 4'-0" wide X 7'-0" high
15. Entrance Type: E1: Two-speed, side-opening; W1: Single-speed, center-opening
16. Door Operation: High-speed, heavy-duty door operator. Minimum Opening Speed: 2½ fps

17. Door Protection: Three-dimensional infrared, full screen device, with differential timing, nudging, and interrupted beam time
18. Hydraulic Type: Direct plunger
19. Guide Rails: Planed Steel Tees
20. Buffers: Spring
21. Car Enclosure:
    a. stationary returns
    b. Stainless Steel and Glass enclosure and Car interior finishes provided under this section. Clear height under canopy, Car 8': 0"
    c. Car interior ventilation.
    d. Pad buttons or hooks and vinyl-covered pads.
22. Signal Fixtures: LED illumination. NEMA 4 and NEMA 12 design for weather resistance, vandal resistant buttons and fixtures.
    a. Hall and Car Pushbutton Stations:
        1) Single hall pushbutton riser
        2) Dual car operating panels
        3) NEMA-4, NEMA-12, Vandal resistant car and hall pushbuttons
    b. Car Position Indicators:
        1) Digital in car station with car direction arrows
    c. Car Direction Lanterns: All car entrance columns with volume adjustable electronic chime or tone, vandal-resistant assembly.
23. Communication System:
    a. Intercom with Distress Signal

    b. Self-Dialing, Vandal Resistant, Push to Call, Two-Way Communication System with Recall, Tracking, and Voiceless Communication
24. Additional Features:
    a. Hoistway access switches, top and bottom floors
    b. Hoistway door unlocking device, all floors
    c. Anti-nuisance feature
    d. CCTV provisions, all cars
    e. Firefighters' control panel, remote conduit, and wiring
    f. Sill support angles
    g. Firefighters' telephone jack
    h. Liftnet Remote Monitoring System
    i. Provide pit access ladder(s)
    j. System diagnostic means and instructions
    k. Platform Isolation, Jack to Platen Connections
    l. Hydraulic Pump Unit with Oil Tank, UV5A Control Valve Unit, or approved equal, and Controller Sound Isolation
    m. Jack Hole, Outer Casing, and Watertight PVC Inner Casing with Secondary Containment Provisions

2.3 MATERIALS

A. Steel:
1. Sheet Steel (Furniture Steel for Exposed Work): Stretcher-leveled, cold-rolled, commercial quality carbon steel, complying with ASTM A366, matte finish.
2. Sheet Steel (for Unexposed Work): Hot-rolled, commercial quality carbon steel, pickled and oiled, complying with ASTM A568/A568M-03.
3. Structural Steel Shapes and Plates: ASTM A36.

B. Stainless Steel: Type 316 complying with ASTM A240, with standard tempers and hardness required for fabrication, strength, and durability. Apply mechanical finish on fabricated work in the locations shown or specified, Federal Standard and NAAMM nomenclature, with texture and reflectivity required to match Architect's sample. Protect with adhesive paper covering.
   1. No. 4 Satin: Directional polish finish. Graining directions as shown or, if not shown, in longest dimension.
   2. Textured: Provide 5WL as manufactured by Rigidized Metals or Windsor pattern as manufactured by Rimex Metals or approved equal with .050 inches mean pattern depth with bright directional polish (No. 4 satin finish).
   3. Burnished: Non-directional, random abrasion pattern.

C. Aluminum: Extrusions per ASTM B221; sheet and plate per ASTM B209.

D. Plastic Laminate: ASTM E84 Class A and NEMA LD3.1, Fire-Rated Grade (GP-50), Type 7, 0.050" ±.005" thick, color and texture as follows:
   1. Exposed Surfaces: Color and texture selected by Architect.
   2. Concealed Surfaces: Contractor's standard color and finish.

E. Fire-Retardant Treated Particle Board Panels: Minimum 3/4" thick backup for natural finished wood and plastic laminate veneered panels, edged and faced as shown, provided with suitable anti-warp backing; meet ASTM E84 Class "I" rating with a flame-spread rating of 25 or less, registered with Local Authorities for elevator finish materials.

F. Natural Finish Wood Veneer: Standard thickness, 1/40" thoroughly dried conforming to ASME/HPMA HP-1983, Premium Grade. Place veneer, tapeless spliced with grain running in direction shown, belt, and polish sanded, book-matched. Species and finish designated and approved by Architect.

G. Paint: Clean exposed metal parts and assemblies of oil, grease, scale, and other foreign matter and factory paint one shop coat of standard rust-resistant primer. After erection, provide one finish coat of industrial enamel paint. Galvanized metal need not be painted.

H. Prime Finish: Clean all metal surfaces receiving a baked enamel paint finish of oil, grease, and scale. Apply one coat of rust-resistant primer followed by a filler coat over uneven surfaces. Sand smooth and apply final coat of primer.

I. Baked Enamel Finish: Prime finish per above. Unless specified "prime finish" only, apply and bake three additional coats of enamel in the selected solid color.

J. Flooring: 5 layer methacrylate-based decorative chip flooring system.

K. Glass: Low-Iron heat-strengthened laminated safety glass, minimum 9/16" thick, conforming to ANSI Z97.1 and CPSC 16 CFR Part 1201.

2.4 CAR PERFORMANCE

A. Car Speed: ± 10% of contract speed under any loading condition. -

B. Car Capacity: Safely lower, stop and hold 125% of rated load.

C. Car Stopping Zone: ±1/4" under any loading condition.

D. Door Times: Seconds from start to fully open or fully closed:
   1. Cars E1 & W1: Door open: 1.9 seconds. Door close: 2.9 seconds.

E. Car Floor-to-Floor Performance Time: Seconds from start of doors closing until doors are 3/4 open (1/2 open for side opening doors) and car level and stopped at next successive floor under any loading condition or travel direction:
   1. Cars E1 & W1: 14.5 seconds.

F. Pressure: Fluid system components shall be designed and factory tested for 500 p.s.i. Maximum operating pressure shall be 400 p.s.i.

G. Car Ride Quality:
   1. Acceleration and Deceleration: Smooth constant and not less than 1.5 feet/second^2 with an initial ramp between 0.5 and 0.75 second. Sustained Jerk: Not more than 6 feet/second^3.
   2. Measurement Standards: Measure and evaluate ride quality consistent with ISO 18738, using low pass cutoff frequency of 10 Hz and A95 peak-to-peak average calculations.

H. Noise and Vibration Control
   1. Airborne Noise: Measured noise level of elevator equipment and its operation shall not exceed 60 dBA inside car under any condition including door operation and car ventilation exhaust blower on its highest speed. Limit noise level in the machine room relating to elevator equipment and its operation to no more than 80 dBA. All dBA readings to be taken 3'-0" off the floor and 3'-0" from the equipment using the “A” weighted scale.
   2. Vibration Control: All elevator equipment provided under this contract, including power unit, controller, oil supply lines, and their supports shall be mechanically isolated from the building structure and electrically isolated from the building power supply and to each other to minimize the possibility of objectionable noise and vibrations being transmitted to occupied areas of the building.

2.5 OPERATION

A. Collective Microprocessor-Based:
   1. Operate car without attendant from pushbuttons in car and located at each floor. When car is available, automatically start car and dispatch it to floor corresponding to registered car or hall call. Once car starts, respond to registered calls in direction of travel and in the order the floors are reached.
   2. Do not reverse car direction until all car calls have been answered, or until all hall calls ahead of car and corresponding to the direction of car travel have been answered.
   3. Slow car and stop automatically at floors corresponding to registered calls, in the order in which they are approached in either direction of travel. As slowdown is initiated for a hall call, automatically cancel hall call. Cancel car calls in the same manner. Hold car at arrival floor an adjustable time interval to allow passenger transfer.
   4. Answer calls corresponding to direction in which car is traveling unless call in the opposite direction is highest (or lowest) call registered.
   5. Illuminate appropriate pushbutton to indicate call registration. Extinguish light when call is answered.

B. Other Items:

1. Low Oil Control: In the event oil level is insufficient for travel to the top floor, provide controls to return elevator to the main level and park until oil is added.
2. Load Weighing: Provide means for weighing car passenger load. Control system to provide dispatching at main floor in advance of normal intervals when car fills to capacity. Provide hall call by-pass when the car is filled to preset percentage of rated capacity and traveling in down direction. Field adjustment range: 10% to 100%.
3. Anti-Nuisance Feature: If car loading relative to weight in car is not commensurate with number of registered car calls, or activation of door protection device is not commensurate with number of registered car calls, cancel car calls.
4. Independent Service: Provide controls for operation of each car from its pushbuttons only. Close doors by constant pressure on desired destination floor button or door close button. Open doors automatically upon arrival at selected floor.

C. Firefighters' Service: Provide equipment and operation in accordance with code requirements.

D. Automatic Car Stopping Zone: Stop car within 1/4" above or below the landing sill. Maintain stopping zone regardless of load in car, direction of travel, distance between landings.

E. Remote Monitoring and Information: Each controller shall provide the following output information, including data logging, fault logs operational events, performance information including car speed, floor to floor times, and door times. The system shall be real time, capable of driving remote color LCD monitors that continually display the status of each car and calls. Provide each Car with a complete, interactive elevator monitoring system.
   1. The system shall concurrently display all units in a group and separate units on one screen in a graphical format and record the following information for each monitored unit:
      a. Car status:
         1) Group operational mode
         2) In/out of service
         3) Supervisory failure
         4) Location and direction of hall calls
         5) Phase I operation
      b. Individual car status – expandable menus:
         1) Direction of travel
         2) Independent service
         3) Hall button failure
         4) Inspection service
         5) Firefighters' service
         6) Position of elevator
         7) Door status (open, opening, closing, closed)
         8) Door dwell time
         9) Standby power operation/sequence
         10) Door detector
         11) Safety circuit
         12) Door zone
         13) Stop switch
         14) Alarm button
         15) Registered car calls
         16) Out of level
         17) Machine room temperature exceeds 95 degrees
         18) Stop counter (number of starts)

19) Car speed
20) Door open times
21) Door close time
22) Start to stop motion time
23) Emergency two-way communication device
24) Air conditioner/heater
25) Floor lockouts (car or hall)
26) Lobby recall
27) Firefighters' service
28) Up/down peak

c. Service Driven Outages:
1) Independent service
2) Car out of service
3) Lobby return, cleaning

d. Maintenance Activity "Indicators":
1) Top of car inspection
2) Hoistway access
3) Phase I and II
4) Independent service
5) Out of service

2. Faults monitored with visual and audible alarm, triggered by combinations of any of the above status points:
a. Safety circuit
b. Alarm bell
c. Stop switch
d. Emergency two-way communication device
e. Door reversal device
f. At least six user defined faults or events, i.e. water in pit, high machine room/cab temperature
g. Transmit email when any monitored faults occur.

3. If out of service 15 minutes, initiate email to designated address. If fault continues more than eight hours, send email hourly until car returned to service.

F. Reporting Requirements: System shall provide reports in color graphical format both on-screen and in printed form capability to conveniently switch from one report type to another and from one bank to another using minimal mouse clicks and key strokes. Reports shall be displayed after minimal waiting time. Data for all reports shall be continuously recorded and stored. Reports shall be displayed by simply selecting a date and time range, bank of equipment, and report type. Date and time range selections shall carry forward from one report selection to the next. Reporting functions shall be sub-divided into the following categories:

1. Traffic Reports:
a. Number of hall calls per floor (hall call distribution on a per floor basis)
b. Number of hall calls per hour (24 hour time-line)
c. Hall call waiting times per floor (hall call waiting time distribution on a per floor basis)
d. Hall call waiting times per hour (24 hour time-line)
e. Distributed hall call response graph (24 hour time-line)
f. Detailed hall call response graph (% calls / n seconds)
g. Longest wait times including floor number, wait time, date, time, and direction

2. Fault Reports:
a. Ten most recent faults (most recent faults listed per bank and per car)

b. Fault log – displays the entire fault log for a given time period
c. Faults per car (fault distribution on a per car basis)
d. Faults per floor (fault distribution on a per floor basis)
e. Faults per day/week/month (fault distribution on a per unit or group basis)

3. Car Use Statistics:
   a. Car use by hour (24 hour time-line of car calls, car starts, door cycles, delayed car, load by pass)
   b. Car use statistics (same as above, shown for an entire bank)
4. Group Service Log:
   a. Cars in service (24 hour time-line with text log of group availability of each car)
   b. Group functions (24 hour time-line with text log of actuation of group functions: Up peak, down peak, fire service, emergency power).
5. Playback capability: Provide means to playback last fault events:
   a. Provide means to store two years of data, prior to present.
   b. Provide means to search data and display 50 faults in sequence of occurrence.
   c. Provide means to transfer to permanent medium, CD, or approved equal.
   d. Provide means to print out playback data.

G. Motion Control: Microprocessor-based AC type with unit valve suitable for operation specified and capable of providing smooth, comfortable car acceleration and retardation. Limit the difference in car speed between full load and no load to not more than ±10% of the contract speed in either direction of travel.

H. Selective Leveling: Provide means to limit elevator car speed when traveling between adjacent floors.

I. Door Operation: Automatically open doors when car arrives at main floor. At expiration of normal dwell time, close doors. Reopen doors when car is designated for loading. Provide front or rear selective door operation.

J. Standby Lighting and Alarm: Car mounted battery unit with solid-state charger to operate alarm bell and car emergency lighting. Battery to be rechargeable with minimum five-year life expectancy. Include required transformer. Provide constant pressure test button in service compartment of car operating panel. Provide lighting integral with portion of normal car lighting system.

K. Battery Lowering Feature: Upon loss of normal power, provide controls to automatically lower the car(s) to the nearest lower landing. Upon arrival at the lowest landing, the elevator doors shall open automatically and remain open until regular door time has expired. The elevator shall then become deactivated. The standby power source shall be provided via 12-volt D.C. battery units installed in machine room, including solid-state charger and testing means mounted in a common metal container. Battery to be rechargeable lead acid or nickel cadmium with a ten-year life expectancy. Upon restoration of normal power, the elevator shall automatically resume normal operation.

L. Battery Standby Power Pack for Air Conditioner/Heater: Upon loss of normal power, standby power source shall be provided via 12-volt D. C. battery units installed in machine room, including solid-state charger and testing means mounted in a common metal container. Battery to be rechargeable lead acid or nickel cadmium with a ten-year life expectancy. Standby power source shall provide minimum four hours operation.

2.6 MACHINE ROOM EQUIPMENT

A. Arrange equipment in spaces shown on drawings.

B. Pump Unit: Assembled unit consisting of positive displacement pump, induction motor, master-type control valves combining safety features, holding, direction, bypass, stopping, manual lowering functions, shut off valve, oil reservoir with protected vent opening, oil level gauge, outlet strainer, drip pan, muffler, all mounted on isolating pads. Provide oil cooling unit and oil temperature thermostat to maintain oil at operating temperature. Provide Solid State soft start with closed transition. Design unit for 120 up starts/hour.

C. Landing System: Solid-state, magnetic, or optical type.

D. Controller: UL/CSA labeled.
   1. Compartment: Securely mount all assemblies, power supplies, chassis switches, and relays, on a substantial self-supporting steel frame. Completely enclose equipment with covers. Provide means to prevent overheating.
   2. Relay Design: Magnet operated with contacts of design and material to insure maximum conductivity, long life, and reliable operation without overheating or excessive wear. Provide wiping action and means to prevent sticking due to fusion. Contacts carrying high inductive currents shall be provided with arc deflectors or suppressors.
   3. Microprocessor-Related Hardware:
      a. Provide built-in noise suppression devices which provide a high level of noise immunity on all solid-state hardware and devices.
      b. Provide power supplies with noise suppression devices.
      c. Isolate inputs from external devices (such as pushbuttons) with opto-isolation modules.
      d. Design control circuits with one leg of power supply grounded.
      e. Safety circuits shall not be affected by accidental grounding of any part of the system.
      f. System shall automatically restart when power is restored.
      g. System memory shall be retained in the event of power failure or disturbance.
      h. Equipment shall be provided with Electro Magnetic Interference (EMI) shielding within FCC guidelines.
   4. Wiring: CSA labeled copper for factory wiring. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.
   5. Permanently mark components (relays, fuses, PC boards) with symbols shown on wiring diagrams.
   6. Monitoring System Interface: Provide controller with serial data link through RJ45 Ethernet connection and install all devices necessary to monitor items outlined in Section 2.13. Elevator contractor responsible to connect monitoring system interface to machine room monitoring compartment and LAN. Wiring from the LAN to the machine room monitoring compartment by others.
   7. Provide controller or machine mounted auxiliary lockable “open” disconnect if mainline disconnect is not in sight of controller and/or machine.
   8. Provide control panel compliant with UL 508A SB.SCCR of 5000A required.

E. Muffler: Provide in discharge oil line near pump unit. Design shall dampen and absorb pulsation and noise in the flow of hydraulic fluid.

F. Piping and Oil: Provide piping, connections and oil for the system. Buried piping shall be secondarily contained with watertight Schedule 40 PVC sleeves between elevator machine room and pit, including heat tracing and pipe insulation. Threaded fittings shall be used to connect the steel piping from the power unit to the oil cooler. A minimum of two sound isolation couplings shall be provided between the pump unit and oil line and the oil line and jack unit. Provide isolated pipe stands or hangers as required.

G. Shut-Off Valve: manual ball-type valve on line adjacent to pump unit.

H. Pressure Switch: Provide oil pressure sensitive switch in line to automatically close and prevent loss of oil in cylinder upon loss of pressure in oil supply line.

2.7 HOISTWAY EQUIPMENT

A. Guide Rails: Planed steel T-sections for car of suitable size and weight for the application, including seismic reactions, including brackets for attachment to building structure. Provide rail backing to meet code requirements. Provide bracketing, at top and bottom of floor beams. No additional structural points of rail attachment, other than those shown on the Contract Documents, will be provided.

B. Buffers: Spring type with blocking and support channels.

C. Scavenger Pump: Self-priming and self-lubricating type, with discharge pressure of 200 psi and 90 gph capacity. Include Check Valve and a mesh screen strainer at 200 microns. A float shall be included to prevent operation if the pit is flooded.

D. Hydraulic Jack Assembly:
1. Cylinders: Seamless steel pipe. Design head to receive unit-type packing and provide means to collect oil at cylinder head and return automatically to oil reservoir. Provide secondary containment/cylinder protection. Provide cylinder stabilizer bracketing between guide rails as required. The piston packing seal shall be changed at the following intervals:

    1) Prior to putting the Car into service for beneficial use
    2) After the 12 month warranty period described in Section 1.8 – 3. above.

2. Plungers: Polished seamless steel tubing or pipe. If plunger length exceeds 24'-0", provide two or more sections not exceeding 16'-0" in length, or coordinate installation of longer unit at the jobsite. Join sections by internal threaded couplings. Multiple section jack units shall be factory polished while assembled and marked for proper future reassembly. Isolate plunger from car frames.

E. Jack Support and Fluid Shut-Off Valves: Provide steel pit channels to support jack assembly and transmit loads to building structure. Provide intermediate stabilizers as required. Provide manual on/off valves in oil lines adjacent to pump unit and jack units in pit.

F. Well Hole Casing:
1. Well hole is to be provided by Elevator Contractor. No additional compensation will be allowed for unforeseen conditions of any kind or spoil removal.
2. Install steel outer casing minimum 18" diameter. Install watertight sleeve over jack assembly for secondary containment prior to insertion into the outer casing. Extend PVC

sleeve through pit floor slab to underside of jack support beams and seal with non-permeable membrane. Seal well opening at the pit floor with hydraulic quick setting cement. Provide PVC vision/access ports.

G. Valves:
   1. Provide a pressure sensitive, mechanically-actuated seismic safety valve, conforming to ASME A17.1, Rule 3.19.4.7. Connect valve directly to jack assembly inlet.
   2. Provide Shut-Off Valve, manual ball-type valve on-line adjacent to pump unit.
   3. Provide easily accessible Overspeed Rupture Valve inside the hoistway elevator pit.

H. Terminal Stopping: Provide normal and final devices.

I. Electrical Wiring and Wiring Connections:
   1. Conductors and Connections: Copper throughout with individual wires coded and connections on identified studs or terminal blocks. Use no splices or similar connections in wiring except at terminal blocks, control compartments, or junction boxes. Provide 10% spare conductors throughout. Run spare wires from car connection points to individual elevator controllers in the machine room.
   2. Conduit: Galvanized steel conduit, EMT, or duct. Flexible conduit length not to exceed 3'-0". Flexible heavy-duty service cord may be used between fixed car wiring and car door switches for door protective devices. Conduit from the closest hoistway of each elevator group or single elevator to the firefighters' control room.
   3. Traveling Cables: Flame and moisture-resistant outer cover. Prevent traveling cable from rubbing or chafing against hoistway or equipment within hoistway.
      a. Provide two RG-6/U coaxial CCTV cable and four pair of shielded 18 gauge wire within traveling cable from car controller to car top junction box, plus 3'-0" excess loop at both ends.
      b. Provide two pair of 18 gauge wire for CCTV power.
      c. Provide four pair of spare shielded communication wires in addition to those required to connect specified items.
      d. Tag spares in machine room. Provide cables from controller to car top.
   4. Auxiliary Wiring: Provide conduit, wiring and connections for fire alarm initiating devices, emergency two-way communication system, paging speaker, CCTV, digital video display, security system, intercom, and announcement speaker and/or background music from the machine room junction box to each car controller in machine room.

J. Floor Numbers: Stencil paint 4" high floor designations in contrasting color on inside face of hoistway doors or hoistway fascia in location visible from within car.

2.8 HOISTWAY ENTRANCES

A. Complete entrances bearing fire labels from a nationally recognized testing laboratory approved within the governing jurisdiction.

B. Frames: 14 gauge hollow metal at all floors. Mitered and welded head to jamb assembly at all floors. Clad frames with finish material indicated in finish schedule at all floors. Provide Arabic floor designation/Braille plates, centered at 60" above finished floor, on both side jambs of all entrances. Provide plates at main egress landing with "Star" designation. Provide "Star of Life" designation plates at height of 78"-84" above finished floor on both side jambs at all floors.

Braille indications shall be below Arabic floor designation. Provide cast floor designation/Braille plates as manufactured by SCS Elevator Products, Inc. or Vision Mark. Provide 14 gauge subframe for special architectural overlay finishes at all floors. Size clear opening of subframes at least 4" wider and 2" higher than clear finish opening.

C. Door Panels: Stainless steel with Glass Panels. Provide leading edges of center-opening doors with rubber astragals. Provide a minimum of two gibs per panel, one at leading and one at trailing edge with gibs in the sill groove entire length of door travel. Construct door panels with interlocking, stiffening ribs. Architectural metal cladding shall wrap around leading and trailing edge of panel and return a minimum of 1/2" on rear side of leading edge of panel at all floors. Provide safety retainers as required by Rule 2.11.11.8 of ASME A17.1.The top and bottom of horizontally sliding doors shall be provided with a means of retaining the door panels in position if the primary guiding means fail, and shall prevent displacement of the door panel (top and bottom) by not more than three fourths of an inch into the hoistway.

D. Entrance Equipment:
   1. Door Hangers: Two-point hanger roller with neoprene roller surface and suspension with eccentric upthrust roller adjustment.
   2. Door Tracks: Bar or formed, cold-drawn removable steel tracks with smooth roller contact surface.
   3. Door Interlocks: Operable without retiring cam. Paint interlock box flat black.
   4. Door Closers: Spring, spirator, or jamb/strut mounted counterweight type. Design and adjust to insure smooth, quiet mechanical close of doors.
   5. Hoistway Door Unlocking Device: Provide unlocking device with escutcheon in door panel at all floors, with finish to match adjacent surface.

E. Sight Guards: 14 gauge, same material and finish as hoistway entrance door panels. Construct without sharp edges

F. Hoistway Access Switches: Mount in entrance frame side jamb at top and bottom floors. Provide switch with faceplate

G. Sills: Nickel Silver.

H. Sill Supports: Structural or formed steel designed to support door sill based upon car loading classification. Mount to eliminate need for grout under the sill.

I. Toe Guards and Hanger Covers: 14 gauge furniture steel with black enamel finish. Provide toe guards, and hanger covers. Provide car door interlock to prevent opening of car doors outside the unlocking zone.

J. Struts and Headers: Provide for vertical support of entrances and related material. Provide door open bumpers on entrances equipped with vertical struts.

K. Finish of Frames and Doors: Provide welded entrance frames with # 4 finish stainless steel finish.

L. Hoistway Access:
   1. Hoistway Door Unlocking Device: Provide unlocking device with locking escutcheon collar in door panel at all floors, with finish to match adjacent surface.

2. Hoistway Access Switches: Mount in entrance frame side jamb at all terminal landings. Provide switch with approved faceplate.

2.9 CAR EQUIPMENT

A. Frame: Welded or bolted, rolled or formed steel channel construction to meet load classification specified.

B. Platform: Isolated type, constructed of steel, or steel and wood which is fireproofed on underside. Design and construct to accommodate load classification requirements. Provide Class “A” construction for passenger elevators. Provide recess to accommodate a minimum 1" floor thickness.

C. Platform Apron: Minimum 14 gauge steel, reinforced and braced to car platform, front and rear with black enamel finish.

D. Guide Shoes: Roller type with three or more spring dampened, sound-deadening rollers per shoe. Maximum roller rotation speed, 350 rpm. Solid type.

E. Finish Floor Covering: Provided:
1. Rubber tile 1/8" thick with 1" diameter by 0.025 high, raised circular pattern. Color selected by Architect.

F. Sills: One piece extrusion with extruded extension between car entrance columns to face of car front return. Extruded extension to match finish of sill.
1. Stainless steel.

G. Door Hangers: Two-point hanger roller with neoprene roller surface and suspension with eccentric upthrust roller adjustment.

H. Door Track: Bar or formed, cold-drawn removable steel track with smooth roller contact surface.

I. Door Header: Construct of minimum 12 gauge steel, shape to provide stiffening flanges.

J. Door Electrical Contact: Prohibit car operation unless car door is closed. Provide car door interlock to prevent opening of car doors outside the unlocking zone.

K. Door Clutch: Heavy-duty clutch, linkage arms, drive blocks and pickup rollers or cams to provide positive, smooth, quiet door operation. Design clutch so car doors can be closed, while hoistway doors remain open.

L. Restricted Opening Device: Provide car-door interlock to prevent opening of car doors outside unlocking zone.

M. Door Operator: High-speed, heavy-duty door operator capable of opening doors at no less than 2.5 fps. Accomplish reversal in no more than 2½" of door movement. Provide solid-state door control with closed loop circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Provide a minimum of four controller-activated motion profiles, per floor, per door, to maintain consistent, smooth, and quiet door

operation at all floors, regardless of door weight or varying air pressure. Acceptable closed-loop door operators:

1. KONE: AMD 2.0
2. Otis: AT 400 - i Motion II (Optional)
3. Thyssenkrupp: HD91 StarTrac
4. G.A.L.: MOVFR

N. Door Control Device:

1. Infrared Reopening Device:
   a. Black, fully enclosed device with full screen infrared matrix or multiple beams extending vertically along leading edge of each door panel to minimum height of 7'-0" above finished floor. Provide additional beams full height of door panels. Device shall prevent doors from closing and reverse doors at normal opening speed if beams are obstructed while doors are closing, except during nudging operation. In event of device failure, provide for automatic shutdown of car at floor level with doors open:
   b. Acceptable Infrared Reopening Device:
      1) Cegard/MAX-154 by CEDES
      2) Gatekeeper by Adams
      3) Magic Edge by Tri-Tronics
      4) Microlite by thyssenkrupp
      5) Microscan E by T.L. Jones
      6) Pana40 Plus by Janus
2. Nudging Operation: After beams of door control device are obstructed for a predetermined time interval (minimum 20.0-25.0 seconds), warning signal shall sound and doors shall attempt to close with a maximum of 2.5 foot pounds kinetic energy. Activation of the door open button shall override nudging operation and reopen doors.
3. Interrupted Beam Time: When beams are interrupted during initial door opening, hold door open a minimum of 3.0 seconds. When beams are interrupted after the initial 3.0 second hold open time, reduce time doors remain open to an adjustable time of approximately 1.0-1.5 seconds after beams are reestablished.
4. Differential Door Time: Provide separately adjustable timers to vary time that doors remain open after stopping in response to calls.
   a. Car Call: Hold open time adjustable between 3.0 and 5.0 seconds.
   b. Hall Call: Hold open time adjustable between 5.0 and 8.0 seconds. Use hall call time when car responds to coincidental calls.

O. Car Operating Panel:

1. Passenger: Two car operating panels with faceplates consisting of a metal box containing the vandal resistant operating fixtures, mounted behind the car stationary front return panel.
   a. Provide manually operated stop switch within Firefighters' Phase II compartment Arrange switch to sound group control panel distress signal when actuated.
   b. Provide "door open" button to stop and reopen doors or hold doors in open position.
   c. Provide "door close" button to activate door close cycle. Cycle shall not begin until normal do
2. Suitably identify floor buttons, alarm button, door open button, door close button, and emergency push-to-call button with approved cast tactile symbols recessed flush mounted fastenings. Configure plates per local building code accessibility standards including

Braille. Locate top floor button at maximum height allowed above the car floor; no lower than 35" for emergency push-to-call button and alarm button.

3. Provide minimum 3/4" diameter raised floor pushbuttons that illuminate to indicate call registration.
4. Provide alarm button to ring bell located on car, and sound distress signal at group control panel. Illuminate button when actuated.
5. Provide Firefighters' devices and operation. Install firefighters' telephone jack with approved mounting in firefighter's compartment.
6. Provide lockable service compartment with recessed flush door. Door material and finish shall match car return panel or car operating panel faceplate. Inside surface of door shall contain an integral flush window for displaying the elevator operating permit. Include the following controls in lockable service cabinet with function and operating positions identified by permanent signage or engraved legend:
   a. Inspection switch.
   b. Light switch.
   c. Exhaust blower switch.
   d. Independent service switch.
   e. Constant pressure test button for battery pack emergency lighting.
   f. 120-volt, AC, GFCI protected electrical convenience duplex outlet.
   g. Keyed stop switch.
7. Provide black paint filled (except as noted), engraved, or approved etched signage as follows with approved size and font:
   a. Phase II firefighters' operating instructions on inside face of firefighters' compartment door. Engrave filled red firefighters' operation on outside face of compartment door.
   b. Building identification car number on main and auxiliary car operating panels.
   c. "No Smoking" on main and auxiliary car operating panels.
   d. Car capacity in pounds on main car operating panel.
   e. Loading classification and description on car operating panel.

P. Car Top Control Station: Mount to provide safe access and utilization while standing in an upright position on car top.

Q. Work Light and Duplex Plug Receptacle: GFCI protected outlet at top of car. Include on/off switch and lamp guard. Provide additional GFCI protected outlet on car top for installation of car CCTV.

R. Communication System:
1. Two-way communication instrument in car with automatic dialing, tracking, and recall features, with shielded wiring to car controller in machine room. Provide dialer with automatic rollover capability with minimum two numbers.
   a. Actuate two-way communication via "Help" button.
   b. Button or adjacent light jewel shall illuminate and flash when call is acknowledged.
   c. Button shall match car operating panel pushbutton design.
   d. Provide "Help" button tactile symbol, engraved signage, and Braille adjacent to button mounted integral with car front return panel.
2. Firefighters' communication jack in car and firefighters' panel jack bezel shall match adjacent controls.
3. Install remote speaker(s) provided under Item 1.01. E.1 in car behind front return panel with drilled speaker pattern, with shielded wiring to machine room junction box.

4. Provide two-way communication between car and machine room if required.

2.10 CAR ENCLOSURE

A. Passenger Elevator: Provide complete as specified herein and detailed on architectural drawings.
   1. Canopy: Reinforced 12 gauge furniture steel formed panels with lockable, contacted, hinged emergency exit. Interior finish white color reflective baked enamel.
   2. Front and Rear Return Panels: Reinforced 14 gauge furniture steel clad with minimum 16 gauge satin finish stainless steel with cutouts for applied car operating panel(s) and other equipment.
   3. Transom: Reinforced 14 gauge furniture steel clad with minimum 16 gauge satin finish stainless steel full width of enclosure with cutout for car position indicator.
   4. Car Door Panels: Reinforced minimum 16 gauge furniture steel clad with minimum 18 gauge satin finish stainless steel with Glass Panels. Same construction as hoistway door panels. Cladding shall wrap leading and trailing edge of panel a minimum of 1/2" on rear side.
   5. Base: Satin finish stainless steel.
   6. Interior Wall Finish: Stainless Steel with Glass Panels as specified by the Architect, and in conformance with ANSI Z.97.1.
   7. Ventilation: Morrison Products, Inc. three-speed model SOE No. 06-01055 exhaust blower mounted to car canopy on isolated rubber grommets. Exhaust blower shall meet noise and vibration criteria.
   8. Lighting: Provide LED fixtures with wiring and hookup. Coordinate with emergency lighting requirements
   9. Suspended Ceiling: Coordinate with Architectural Drawings.
   10. Handrails: Minimum 1¼" diameter stainless steel tubular grab bar with backing plates and captive nuts across side walls. Special design included in allowance in Interior Wall Finish item above. Bolt rails through car walls from back and mount on 1½" deep solid round stainless steel standoff spacers no more than 18" O.C. Return handrail/guardrail ends to car walls.
   11. Pads and Hooks for the Car. Three-piece removable pads. Two pads covering side walls and adjacent front returns and one covering rear wall. Provide cutouts to access main car operating panel.

2.11 HALL CONTROL STATIONS

A. Pushbuttons: Provide one riser with flush mounted faceplates. Include pushbuttons for each direction of travel that illuminate to indicate call registration. Pushbutton design shall match car operating panel pushbuttons. Single riser at typical floors. Provide vandal resistant pushbutton and light assemblies. Provide LED illumination.

B. Phase I Fire Service fixture, including keyswitch, engraved operating instructions and illuminating jewel.

2.12 SIGNALS

A. Car Direction Lantern:
   1. Provide flush-mounted car lantern in all car entrance columns .

2. Illuminate up or down LED lights and sound tone once for up and twice for down direction prior to car arrival at floor. Illuminate light until the car doors start to close.
3. Sound level shall be adjustable from 20-80 dBA measured at 5'-0" in front of hall control station and 3'-0" off floor.
4. Provide adjustable car door dwell time to comply with ADA requirements relative to hall call notification time.
5. Provide vandal resistant lantern and light assemblies consisting of series of dots or lines for maximum visibility.

B. Car Position Indicator:

1. In addition to position and direction, the display shall interface with the elevator control system to provide system-based messages for the following conditions at a minimum:
   a. Firefighters' Service, Phase I
   b. Independent Service
   c. Car-to-Lobby Activated

C. Faceplate Material and Finish: Satin finish stainless steel, all fixtures. Tamper resistant fasteners for all fastenings exposed to the public.
1. Car Direction Lantern
2. Car Position Indicator
3. Hoistway Access Switch
4. Phase I Keyswitch Faceplate

D. Floor Passing Tone: Provide an audible tone of no less than 20 decibels and frequency of no higher than 1500 Hz, to sound as the car passes or stops at a floor served.

E. Firefighters' Control Panel: Locate in building fire control room. Fixture faceplate, stainless steel satin finish, including the following features:
1. Car position and direction indicator (digital-readout or color SVGA display type). Identify each position indicator with car number.
2. Indicator showing operating status of car.
3. Manual car standby power selection switches and power status indicators.
4. Two-position firefighters' emergency return switches and indicators with engraved instructions filled red.
5. Firefighters' telephone jack.
6. Fixtures and monitor shall be located as directed by Architect. Where applicable, identify all indicators and manual switches with appropriate engraving. Provide conduit and wiring to control panel. Coordinate size and location with Building Console Supplier.

F. Firefighters' Key Box: Flush-mounted box with lockable hinged cover. Engrave instructions for use on cover per Local Fire Authority requirements.

1. System Performance Monitoring:
   a. Hall call registration information: Provide memory capacity for at least the preceding five, 24-hour periods, in blocks of 5- or 15-minute segments, running hour to hour (i.e., 2:00 p.m. to 3:00 p.m.)
      1) Visual and printed summary of hall call registration events by floor, direction, and duration, totaled in 5- or 15-minute segments during any 60-minute block using an internal clock.

2) Visual and printed summary of hall call registration duration averaged for 5- or 15-minute and hourly periods.
3) Visual and printed summary of percentage of hall calls answered within 30 and 60 seconds in each 5- or 15-minute and hourly periods.
4) Visual and printed summary of time periods during which individual cars are not in group operation (operating separately or out of service).

b. Accumulate system fault data including nature of fault, time, and day. Store and retrieval capabilities for minimum 30-day period.

2. Provide printer to produce a hard copy of stored data. Provide directions and software to accomplish information retrieval.

2.13 INTERCOM AND DISTRESS SIGNAL SYSTEM

A. General: Provide intercommunication system for Car. Include all wiring between elevator hoistways and control panels. Include the following stations:

Station Location	Type Station	Selection Buttons to Call
Elevator Machine Room	Master	Control Panel
Lobby Control Panel	Master	Machine Room
Firefighters' Control Panel	Master	Machine Room
Elevator	Remote	Liftnet Monitoring Station

B. Basic Equipment:

1. Amplifier providing static-free voice transmission with adequate volume and minimum distortion at all stations, with pre-amplifier capable of receiving voice and music inputs from building and emergency building communication system.
2. Activation of emergency building communication system overrides all other conversations and permits one-way conversation to all master stations in system.
3. Master Stations:
   a. Speaker-microphone combination and/or handset for two-way communication.
   b. Selection buttons to enable communication with all master stations. Maintain continual reception of hands-free reply from station when a selected button is depressed.
   c. Two-Position "Talk/Listen" Button: Press to talk; release to listen.
   d. Illuminate "in use" light when any master station is being used.
   e. Reset button to make system available for use by any master station.
   f. Volume control knob for adjustment of incoming volume.
   g. Button to establish communications with all stations.
   h. Distress light in lobby panel which illuminates when "push to call" button or alarm button in car is actuated. Energize distress light and buzzer or chime until intercom selection button for that car has been depressed. Sound buzzer or chime in lobby panel simultaneously with illumination of distress light.
4. Remote Stations:
   a. Station in car shall be activated by "push to call," two-way communication button. "Push to call" button shall illuminate and flash when call is acknowledged. Button shall match car operating panel pushbutton design. Provide uppercase "PUSH TO CALL," "HELP ON THE WAY" engraved signage adjacent to button. Provide "push to call" button tactile symbol, engraved signage, and Braille adjacent to button.

b. Locate car microphone and speaker, or transceiver/speaker combination behind front return panel.

C. Station Housings:
1. House master station in machine room in a metal compartment with baked enamel finish. Attach to the group elevator supervisory control panel or wall mount. Provide communication handset with 25'-0" long cord.
2. Provide control center master intercoms with stainless steel satin finish faceplates and engraved operating instructions. Coordinate faceplate size and installation of units with building Console Supplier.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to beginning installation of equipment examine hoistway and machine room areas. Verify no irregularities exist which affect execution of work specified.

B. Do not proceed with installation until work in place conforms to project requirements.

3.2 INSTALLATION

A. Install all equipment in accordance with Contractor’s instructions, referenced codes, specification, and approved submittals.

B. Install machine room equipment with clearances in accordance with referenced codes and specification.

C. Install all equipment so it may be easily removed for maintenance and repair.

D. Install all equipment for ease of maintenance.

E. Install all equipment to afford maximum accessibility, safety, and continuity of operation.

F. Remove oil, grease, scale, and other foreign matter from the following equipment and apply one coat of field-applied machinery enamel.
1. All exposed equipment and metal work installed as part of this work which does not have architectural finish.
2. Machine room equipment, hoistway equipment including guide rails, guide rail brackets, and pit equipment.
3. Neatly touch up damaged factory-painted surfaces with original paint color. Protect machine-finish surfaces against corrosion.

G. Clean all architectural finishes and replace or restore any surfaces damaged during construction to like new condition.

H. Final payment, for retainage of 10%, shall not be made for the installation work prior to the conclusion of the Warranty / Maintenance period.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Operating Test: Load elevator to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machine during 30-minute test period. Record failure to perform as required.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 ADJUSTING

A. Install hydraulic jack assembly and guide rails plumb and align vertically with tolerance of 1/16" in 100'-0". Secure guide rail joints without gaps and file any irregularities to a smooth surface.

B. Lubricate all equipment in accordance with Contractor’s instructions.

C. Adjust motors, valves, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks, and safety devices to achieve required performance levels.

3.5 CLEANUP

A. Keep work areas orderly and free from debris during progress of project. Remove packaging materials on a daily basis.

B. Remove all loose materials and filings resulting from work.

C. Clean machine room equipment and floor.

D. Clean pit equipment and floor.

E. Clean hoistways, car, car enclosure, entrances, operating, and signal fixtures.

3.6 TEST RESULTS:

A. Under any load obtain specified contract speed, performance times, stopping accuracy without re-leveling, and ride quality to satisfaction of Consultant. Tests may be conducted under no load, balanced load, and full load conditions.

B. Consultant may test temperature rise in motor windings limited to 50° Celsius above ambient. A full-capacity one hour running test, stopping at each floor for ten seconds in up and down directions, may be required.

C. Engage a factory-authorized service representative to train Owner’s maintenance personnel to operate, adjust, and maintain elevators.

D. Check operation of each elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.
   1. Engage Elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items which cannot be refinished in the field to the shop, make required repairs, and refinish entire unit, or provide new units as required.

END OF SECTION

SECTION 14 24 00

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SECTION 142400
HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Hydraulic elevators as follows:
   1. One passenger elevator, Car located at the Scarsdale Station (W1).

B. Related Requirements:
   1. Division 01 Section – General Requirements
   2. Division 03 Section – Concrete
   3. Division 04 Section – Masonry
   4. Division 05 Section – Metals
   5. Division 06 Section – Wood, Plastics and Composites
   6. Division 09 Section – Finishes
   7. Division 22 Section – Plumbing
   8. Division 23 Section – Heating, Ventilating and Air Conditioning (HVAC)
   9. Division 26 Section – Electrical
   10. Division 27 Section – Communications
   11. Division 28 Section – Fire Alarm Systems

1.2 ALLOWANCE

A. Elevator Car Allowances: Provide finished passenger elevator cars under the elevator car allowance which includes furnishing and installing the following:
   1. Car wall finishes including trim.
   2. Car ceiling finishes including lighting, wring, and coordination of battery-operated emergency lighting.
   3. Car door finishes.
   4. Car light fixtures.
   5. Handrails.
   6. Cutouts and other provisions for installing elevator signal equipment in cars.
   7. Mounting for protective pads

1.3 DEFINITIONS

A. Terms used are defined in the latest edition of the Safety Code for Elevators and Escalators, ASME A17.1.

1.4 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44 (2013)

B. Accessibility Requirements: Comply with 2010 ADA standards for Accessible Design and with ICC A117.1. Comply with Uniform Federal Accessibility Standard, UFAS.
   1. The term “withstand” means the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event.
   2. Project Seismic Design Category: B.

3. Elevator Component Importance Factor (Ip): 1.0
4. Design Spectral Response Acceleration (SDS): 0.29

1.5 SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures, hoistway entrances, and operation, control, and signal systems. Include product data for signal fixtures, lights, graphics, Braille plates, and details of mounting provisions.

B. Shop Drawings:
1. Include plans, elevations, sections, and large-scale details indicating openings at each landing, machine room layout, coordination with building structure, relationships with other construction, and locations of equipment.
2. Include large-scale layout of car operating panel.
3. Indicate maximum dynamic and static loads imposed on building structure at points of support and maximum and average power demands.
4. Power Confirmation Information: Include motor horsepower, code letter, starting current, full - load running current, and demand factor. Provide engineered power consumption estimates based on 120 starts per hour.

C. Samples for Initial Selection: For finishes involving surface treatment, paint or color selection.

D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes:
1. Samples of sheet materials: 3" (75 mm) square.
2. Running trim members: 4" (100 mm) lengths.

E. Operation and Maintenance Data:
1. For elevators to include in emergency, operation, and maintenance manuals.
2. In addition to items specified in Division 01 Section “General Requirements” include diagnostic and repair information available to manufacturer’s and Installer’s maintenance personnel.

F. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

1.6 QUALITY ASSURANCE

A. Compliance with Regulatory Agencies: Comply with most stringent applicable provisions of following codes, laws, and/or authorities, including revisions and changes in effect:
1. New York State Building Code (IBC 2015) w/2017 Supplements
2. Safety Code for Elevators and Escalators, ASME A17.1 (2013)
3. Guide for Inspection of Elevators, Escalators, and Moving Walks, ASME A17.2
4. Elevator and Escalator Electrical Equipment, ASME A17.5
5. National Electrical Code, NFPA 70 (2017)
6. New York State - American with Disabilities Act (2010)
7. New York State Fire Code (2018) [IFC 2015]

8. Requirements of most stringent provision of local authority having jurisdiction.
9. Life Safety Code, NFPA101

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver material in Contractor's original unopened protective packaging.

B. Store material in original protective packaging. Prevent soiling, physical damage, or moisture damage.

C. Protect equipment and exposed finishes from damage and stains during transportation and construction.

1.8 OPERATING AND MAINTENANCE MANUALS

A. Maintenance Manuals: Prior to installation, Elevator Contractor shall submit two (2) complete sets of operation and maintenance manuals for approval. After Metro North Railroad approval and prior to the beginning of acceptance testing, four (4) sets of the approved manuals shall be provided by the Elevator Contractor.

1.9 TRAINING OF OWNER'S PERSONNEL

A. The Contractor shall train the owner's personnel in maintenance.

B. Training shall be given by personnel qualified, in the care, adjustment and operation of the elevator system.

C. Training shall include, but not be limited to, the car, adjustment, operation and sequence function of the operation and control systems.

D. Training shall be given during normal working hours of normal working days. The training period shall be assumed to be four-hours.
1. The owner shall also have the option to assign personnel to observe and be retrained during the final tuning and adjusting of the elevator.
2. Five copies of the operating and maintenance manuals shall be prepared by the Contractor and shall be utilized by the Contractor for instruction purposes.
    a. After completion of all instructions, the five copies of the complete manual shall be turned over to the owner.
    b. The time and place of the instructions shall be coordinated with the owner.

E. Training shall also include but not be limited to the following:
1. Operation of elevator under emergency condition.
2. Operation and maintenance of the elevator Fire Fighters' system.
3. Safety procedures in gaining access to elevator pit.
4. Safety procedures in gaining access to elevator hoistway.
5. Safety procedure in removing passengers from stalled elevator.
6. Operation of top of car operating station, elevator communication, safety edge, pit stop switch, leveling device, etc.

1.10 WARRANTY

A. Provide project warranty effective for one (1) year from the final acceptance of the elevator, which shall be signed by Contractor, Installer and Manufacturer, agreeing to replace/repair/restore defective materials and workmanship of elevator during warranty period.

1. "Defective" is hereby defined to include, but is not limited to: operation or control system failures, excessive wear, excessive malfunctions, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and unusual, unexpected and unsatisfactory conditions.

B. After the one (1) year Warranty Period concludes there shall be an additional 30 day trouble free period. If any elevator outages or unscheduled repairs are performed during this period, not including those due to vandalism of force majeure, then the Warranty period is extended for an additional 30 days.

C. The Contractor shall warrant to the owner that all work furnished under this contract shall be:
1. Free from defects in design, material, and workmanship.
2. Adequate and suitable for any use and purpose specified or referred to in this contract.
3. Suitable for any other use or purpose as represented in writing by the Contractor.
4. In conformance with the drawings, specifications and design criteria supplied to the Contractor by the Engineer.

1.11 MAINTENANCE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months full maintenance by skilled employees of elevator Installer under the supervision and in the direct employ of the Contractor. Include bi-weekly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Repair or replace any parts of equipment whenever required during the maintenance period and use only genuine standard parts produced by the manufacturer of the equipment installed.

B. After the 12 month Maintenance Period there shall be an additional 30 day trouble free period. If any elevator outages or unscheduled repairs are performed during this period, not including those due to vandalism of force majeure, then the Maintenance period is extended for an additional 30 days.

C. All normal work, including regular examination and scheduled repair in accordance with this contract, is to be made during the regular business hours of the Contractor.

D. Contractor shall perform the required mandated inspections and tests as required per local jurisdictions during the term of the included one (1) year maintenance contract.

E. The piston packing seal should be changed at the following intervals:
1. Prior to putting the cab into service under beneficial use;
2. After the 12 month warranty period.

F. Bi-weekly systematic examination, adjustments, cleaning and lubrication of all machinery, machinery space, hoistway and pit. The Contractor shall maintain all parts of the elevator, consisting of, but not limited to machine, motor, controller, selector, pump unit, piston cylinder assembly, valve unit, bearing, winding, rotating element, contact, coil, resistance for operating and motor circuit, leveling device, cam, hoistway door, track and guide, door operating device and door motor, car light, push button, indicator, car lantern and all other elevator signal scheduling and accessory equipment complete.
1. Lubrication: Lubricate bi-weekly (26 times per year at regularly scheduled intervals) all of those mechanical parts recommended to be lubricated by manufacturer of the equipment, or to otherwise lubricate as often as and in the manner specified by said manufacturer.

2. Lubricant and Cleaning: Lubricant shall consist of oil, grease and compound furnished by Contractor, and shall be of the highest quality, the consistencies of which shall be proper for the purposes employed and for the part to which applied. Contractor shall keep guide rails clean. When necessary, the Contractor shall renew guide shoe as required to ensure smooth and quiet operation. All oil reservoirs shall be kept properly sealed to prevent leakage. Approved metal containers shall be provided by the Contractor for the storage of wiping cloths.
3. Cleaning Materials: Cleaning compounds, waste, cloths and other materials are to be supplied by Contractor, it being understood and agreed that cleaning agent employed shall not be flammable or noxious, and must always be stored in approved metal container provided by the Contractor.
4. Cleaning: Contractor shall, remove and discard immediately, all accumulated dirt and debris from the pit areas. Prior to beneficial use and immediately before the end of the Maintenance Period the Contractor shall thoroughly clean down the entire hoistway of all accumulated dirt, grease, dust and debris.
5. Testing: Examine quarterly all safety device including governor, safety, piston cylinder assembly, and conduct annual no load test, annual inspection in accordance with ASME A17.1 and A17.2.
6. Wiring: Repairing and/or replacing all electrical wiring and conductor extending to the elevator from main line switch in the machine room and outlet in the hoistway. The fuses of the main line switch shall be maintained and replaced.
7. Keeping the exterior of the machinery and any other part of the equipment subject to rust, properly painted, identified and presentable at all times. Motor winding and controller coil are to be periodically treated with proper insulating compound.
8. Hydraulic system of pump unit, valve unit, and piston cylinder assembly: Examine and repair as required to maintain in smooth operating condition without any oil leak.

G. Full protective maintenance requirements:
1. Regularly and systematically examine, adjust, lubricate, clean and when conditions warrant repair or replace the following items and all other mechanical or electrical equipment.
2. Hydraulic power unit and accessories: pump, motor, valves, operating valves, pulleys, drive belts, flexible hydraulic hose and fitting assemblies, oil tank, muffler, strainer, sound isolating coupling, plunger, packing gland, scavenger system, piping and other components.
3. Cylinder piston assembly.
4. Controller, Selector and Dispatching Equipment: all components including all relays, solid state components, resistors, condensers, transformers, contacts, leads, dashpots, computer devices, selector switches, mechanical or electrical driving equipment, coils, magnet frames, contact switch assemblies, springs, solenoids, resistance grids, hoistway vanes, magnets and inductors.
5. Hoistway door interlocks or locks and contacts, hoistway door hangers and tracks, bottom door gibs, cams, rollers, and auxiliary door closing devices for power operated doors. Chains, tracks, cams, interlocks, sheaves for vertical bi-folding doors.
6. Hoistway limit switches, slowdown switches, leveling switches and associated cams, vanes, and electronic components.
7. Cab door operator and car door control, door protective device, car frame, car safety mechanism, governor, cable rope, platform, platform flooring, elevator car guide shoes including rollers or replaceable gibs, etc.
8. Car guide rails, top and bottom limit switches.
9. Hoistway door interlocks, track, roller, drive block, door gib etc.
10. All car and hoistway operating fixtures including Main Lobby fixtures, main car operating panels, safety edge, and starter’s panels.
11. Automatic power operated door operators, door protective devices, car door hangers, tracks and car door contacts for both side slide and vertical bi-folding doors.
12. Traveling cables.
13. Elevator control wiring in hoistway and machine room.
14. Car safety mechanism and load weighing equipment.
15. Buffers.
16. Fixture contacts, push-buttons, key switches, locks, lamps and sockets of button stations (car and corridor), corridor lanterns, position indicators (car and corridor), direction indicators.

17. The guide rails shall be kept free of rust. Where roller guides are used, rails shall be kept dry and properly lubricated when sliding guides are used. Renew guide shoe rollers and gibs as required to insure smooth and satisfactory operation.
18. Examine, and make necessary adjustments or repair to the following accessory equipment including relamping of signal equipment: corridor lanterns, car and corridor position indicators, car stations, traffic director station, electric door operators, interlocks, door hangers, safety edge, and intercom systems.
19. The Contractor shall check the group dispatching systems (if applicable) and make necessary tests to insure that all circuits and time settings are properly adjusted, and that the system performs as designed and installed.

H. Contractor shall, at all times during the term of this Agreement, maintain locally an adequate supply of replacement parts in order to perform his obligations pursuant to the terms of this Agreement without any delay whatsoever.
1. The following spare parts shall be provided and kept on-site in a parts cabinet provided by the Contractor. All spare components shall be replenished as required.
    a. Ten (10) gallons of hydraulic oil in two (2) - 5 gallon sealed pails
    b. One (1) solenoid valve coil
    c. One (1) roller guide
    d. Two (2) door operator belts
    e. Two (2) sets of release rollers
    f. Two (2) hanger rollers
    g. Two (2) door gibs
    h. Spare cable for infra-red detector
    i. Two (2) pushbutton units
    j. One (1) gate switch contact
    k. One (1) door interlock contact

I. The Contractor shall keep the elevator maintained to operate at the original contract speed, keeping the original performance time, including acceleration and retardation as designed and installed by the manufacturer. The door operation shall be adjusted as required to maintain the original door opening and door closing times, within legal limits.

J. Metro-North reserves the right to make inspections and tests as and when deemed advisable. If it is found that the elevator and associated equipment are deficient either electrically or mechanically, the Contractor will be notified of these deficiencies in writing, and it shall be his responsibility to make the necessary corrections within 30 days after his receipt of such notice.

K. Approximately six months prior to the end of the contract term, Metro-North may make a thorough maintenance inspection of the elevators covered under the contract. At the conclusion of this inspection, Metro-North may give the Contractor written notice of any deficiencies found. The Contractor shall be responsible for correction of these deficiencies within 30 days after receipt of such notice.

L. Metro-North reserves the right to accept or reject any or all alternates.

M. A complete permanent record of inspections, maintenance, lubrication and callback service for the elevator under service shall be maintained by the contractor in a location determined by the owner. These records are to be available to owner at all times. The records shall indicate the reason the mechanic was in the building, arrival and departure time, the work performed, etc. In addition, a chronological record of all work performed shall be kept in each machine room. Signed work tickets shall also be provided.

N. Contractor shall maintain a complete set of updated electrical wiring diagrams and drawings for the elevator on file with owner and these to become the property of the owner.

O. Contractor shall be responsible to re-lamp all lighting fixtures in the pit, machine room and hoistway as required.

P. Sole Responsibility: The maintenance work shall be performed by only the elevator men directly employed and supervised by the Contractor, who are experienced and skilled in maintaining and shall not be assigned or transferred to any agent or subcontractor.

1.12 EMERGENCY CALL BACK

A. Emergency Callback Service: Provide emergency callback service which consists of promptly dispatching qualified employees in response to requests from the Owner by telephone or otherwise, for emergency callback service on any day of the week, at any hour, day or night, 24-hour-per-day, 7-day-per-week during the Warranty and Maintenance periods.

B. Emergency repair shall be made to restore the equipment to operating order. If repair cannot be made immediately, the mechanic shall notify the Owner or his designated representative as to the reason why.

C. Response time for emergency callback service shall not exceed one (1) hour when the Contractor is advised that a trapped passenger is involved, and two (2) hours when an elevator malfunction occurs which does not involve a trapped passenger.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide borehole hydraulic passenger elevators or comparable product by one of the following:

1. Berringer Elevator Co.
2. Canton Elevator Inc.
3. Elevator Equipment Corporation
4. Elevator Systems (ESI) – Elevator Controller
5. Galaxy – Elevator Controller
6. Leistritz Elevator Corp.
7. Minnesota Elevator, Inc.
8. Monitor Elevator Products
9. Otis Elevator Company
10. Schindler Elevator Corporation
11. Thyssenkrupp Elevator

2.2 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Passenger Elevators Description:
Elevator Identification: Car W1
1. Capacity: 4,000 lbs.
2. Class of Loading: Class A
3. Contract Speed: 125 fpm
4. Machine: Submersible Hydraulic pump
5. Machine Location: Adjacent
6. Operational Control: Single automatic, Collective Microprocessor-Based System
7. Motor Control: Single speed AC with SCR soft start with closed transition
8. Power Characteristics: 208 Volts, 3 Phase, 60 Hertz
9. Stops and Openings: 1 front; 1 rear
10. Floors Served: Street Level, Platform Level, Overpass Level
11. Travel: 15'-2" ±
12. Platform Size: 7'-10" wide X 7'-4" deep
13. Minimum Clear Inside Car: 7'-0" wide x 6'-0" deep
14. Entrance Size: 4'-0" wide X 7'-0" high
15. Entrance Type: Single-speed, center-opening
16. Door Operation: High-speed, heavy-duty door operator. Minimum Opening Speed: 2½ fps
17. Door Protection: Three-dimensional infrared, full screen device, with differential timing, nudging, and interrupted beam time
18. Hydraulic Type: Direct plunger
19. Guide Rails: Planed Steel Tees
20. Buffers: Spring
21. Car Enclosure:
    a. stationary returns
    b. Stainless Steel and Glass enclosure and Car interior finishes provided under this section. Clear height under canopy, Car 8': 0"
    c. Car interior ventilation.
    d. Pad buttons or hooks and vinyl-covered pads.
22. Signal Fixtures: LED illumination. NEMA 4 and NEMA 12 design for weather resistance, vandal resistant buttons and fixtures.
    a. Hall and Car Pushbutton Stations:
        1) Single hall pushbutton riser
        2) Dual car operating panels
        3) NEMA-4, NEMA-12, Vandal resistant car and hall pushbuttons
    b. Car Position Indicators:
        1) Digital in car station with car direction arrows
    c. Car Direction Lanterns: All car entrance columns with volume adjustable electronic chime or tone, vandal-resistant assembly.
23. Communication System:
    a. Intercom with Distress Signal

    b. Self-Dialing, Vandal Resistant, Push to Call, Two-Way Communication System with Recall, Tracking, and Voiceless Communication

24. Additional Features:
    a. Hoistway access switches, top and bottom floors
    b. Hoistway door unlocking device, all floors
    c. Anti-nuisance feature
    d. CCTV provisions, all cars
    e. Firefighters' control panel, remote conduit, and wiring
    f. Sill support angles
    g. Firefighters' telephone jack
    h. Liftnet Remote Monitoring System
    i. Provide pit access ladder(s)
    j. System diagnostic means and instructions
    k. Platform Isolation, Jack to Platen Connections
    l. Hydraulic Pump Unit with Oil Tank, UV5A Control Valve Unit, or approved equal, and Controller Sound Isolation
    m. Jack Hole, Outer Casing, and Watertight PVC Inner Casing with Secondary Containment Provisions

2.3 MATERIALS

A. Steel:
    1. Sheet Steel (Furniture Steel for Exposed Work): Stretcher-leveled, cold-rolled, commercial quality carbon steel, complying with ASTM A366, matte finish.
    2. Sheet Steel (for Unexposed Work): Hot-rolled, commercial quality carbon steel, pickled and oiled, complying with ASTM A568/A568M-03.
    3. Structural Steel Shapes and Plates: ASTM A36.

B. Stainless Steel: Type 316 complying with ASTM A240, with standard tempers and hardness required for fabrication, strength, and durability. Apply mechanical finish on fabricated work in the locations shown or specified, Federal Standard and NAAMM nomenclature, with texture and reflectivity required to match Architect's sample. Protect with adhesive paper covering.
    1. No. 4 Satin: Directional polish finish. Graining directions as shown or, if not shown, in longest dimension.
    2. Textured: Provide 5WL as manufactured by Rigidized Metals or Windsor pattern as manufactured by Rimex Metals or approved equal with .050 inches mean pattern depth with bright directional polish (No. 4 satin finish).
    3. Burnished: Non-directional, random abrasion pattern.

C. Aluminum: Extrusions per ASTM B221; sheet and plate per ASTM B209.

D. Plastic Laminate: ASTM E84 Class A and NEMA LD3.1, Fire-Rated Grade (GP-50), Type 7, 0.050" ±.005" thick, color and texture as follows:
    1. Exposed Surfaces: Color and texture selected by Architect.
    2. Concealed Surfaces: Contractor's standard color and finish.

E. Fire-Retardant Treated Particle Board Panels: Minimum 3/4" thick backup for natural finished wood and plastic laminate veneered panels, edged and faced as shown, provided with suitable anti-warp backing; meet ASTM E84 Class "I" rating with a flame-spread rating of 25 or less, registered with Local Authorities for elevator finish materials.

F. Natural Finish Wood Veneer: Standard thickness, 1/40" thoroughly dried conforming to ASME/HPMA HP-1983, Premium Grade. Place veneer, tapeless spliced with grain running in

direction shown, belt, and polish sanded, book-matched. Species and finish designated and approved by Architect.

G. Paint: Clean exposed metal parts and assemblies of oil, grease, scale, and other foreign matter and factory paint one shop coat of standard rust-resistant primer. After erection, provide one finish coat of industrial enamel paint. Galvanized metal need not be painted.

H. Prime Finish: Clean all metal surfaces receiving a baked enamel paint finish of oil, grease, and scale. Apply one coat of rust-resistant primer followed by a filler coat over uneven surfaces. Sand smooth and apply final coat of primer.

I. Baked Enamel Finish: Prime finish per above. Unless specified “prime finish” only, apply and bake three additional coats of enamel in the selected solid color.

J. Flooring: 5 layer methacrylate-based decorative chip flooring system.

K. Glass: Low-Iron heat-strengthened laminated safety glass, minimum 9/16" thick, conforming to ANSI Z97.1 and CPSC 16 CFR Part 1201.

2.4 CAR PERFORMANCE

A. Car Speed: ± 10% of contract speed under any loading condition. -

B. Car Capacity: Safely lower, stop and hold 125% of rated load.

C. Car Stopping Zone: ±1/4" under any loading condition.

D. Door Times: Seconds from start to fully open or fully closed:
1. Car Door open: 1.9 seconds. Car Door close: 2.9 seconds.

E. Car Floor-to-Floor Performance Time: Seconds from start of doors closing until doors are 3/4 open (1/2 open for side opening doors) and car level and stopped at next successive floor under any loading condition or travel direction:
1. Cars W1: 14.5 seconds.

F. Pressure: Fluid system components shall be designed and factory tested for 500 p.s.i. Maximum operating pressure shall be 400 p.s.i.

G. Car Ride Quality:
1. Acceleration and Deceleration: Smooth constant and not less than 1.5 feet/second^2 with an initial ramp between 0.5 and 0.75 second. Sustained Jerk: Not more than 6 feet/second^3.
2. Measurement Standards: Measure and evaluate ride quality consistent with ISO 18738, using low pass cutoff frequency of 10 Hz and A95 peak-to-peak average calculations.

H. Noise and Vibration Control
1. Airborne Noise: Measured noise level of elevator equipment and its operation shall not exceed 60 dBA inside car under any condition including door operation and car ventilation exhaust blower on its highest speed. Limit noise level in the machine room relating to elevator equipment and its operation to no more than 80 dBA. All dBA

readings to be taken 3'-0" off the floor and 3'-0" from the equipment using the “A” weighted scale.

2. Vibration Control: All elevator equipment provided under this contract, including power unit, controller, oil supply lines, and their supports shall be mechanically isolated from the building structure and electrically isolated from the building power supply and to each other to minimize the possibility of objectionable noise and vibrations being transmitted to occupied areas of the building.

2.5 OPERATION

A. Collective Microprocessor-Based:
   1. Operate car without attendant from pushbuttons in car and located at each floor. When car is available, automatically start car and dispatch it to floor corresponding to registered car or hall call. Once car starts, respond to registered calls in direction of travel and in the order the floors are reached.
   2. Do not reverse car direction until all car calls have been answered, or until all hall calls ahead of car and corresponding to the direction of car travel have been answered.
   3. Slow car and stop automatically at floors corresponding to registered calls, in the order in which they are approached in either direction of travel. As slowdown is initiated for a hall call, automatically cancel hall call. Cancel car calls in the same manner. Hold car at arrival floor an adjustable time interval to allow passenger transfer.
   4. Answer calls corresponding to direction in which car is traveling unless call in the opposite direction is highest (or lowest) call registered.
   5. Illuminate appropriate pushbutton to indicate call registration. Extinguish light when call is answered.

B. Other Items:
   1. Low Oil Control: In the event oil level is insufficient for travel to the top floor, provide controls to return elevator to the main level and park until oil is added.
   2. Load Weighing: Provide means for weighing car passenger load. Control system to provide dispatching at main floor in advance of normal intervals when car fills to capacity. Provide hall call by-pass when the car is filled to preset percentage of rated capacity and traveling in down direction. Field adjustment range: 10% to 100%.
   3. Anti-Nuisance Feature: If car loading relative to weight in car is not commensurate with number of registered car calls, or activation of door protection device is not commensurate with number of registered car calls, cancel car calls.
   4. Independent Service: Provide controls for operation of each car from its pushbuttons only. Close doors by constant pressure on desired destination floor button or door close button. Open doors automatically upon arrival at selected floor.

C. Firefighters’ Service: Provide equipment and operation in accordance with code requirements.

D. Automatic Car Stopping Zone: Stop car within 1/4" above or below the landing sill. Maintain stopping zone regardless of load in car, direction of travel, distance between landings.

E. Remote Monitoring and Information: Each controller shall provide the following output information, including data logging, fault logs operational events, performance information including car speed, floor to floor times, and door times. The system shall be real time, capable of driving remote color LCD monitors that continually display the status of each car and calls. Provide each Car with a complete, interactive elevator monitoring system.

1. The system shall concurrently display all units in a group and separate units on one screen in a graphical format and record the following information for each monitored unit:
    a. Car status:
        1) Group operational mode
        2) In/out of service
        3) Supervisory failure
        4) Location and direction of hall calls
        5) Phase I operation
    b. Individual car status – expandable menus:
        1) Direction of travel
        2) Independent service
        3) Hall button failure
        4) Inspection service
        5) Firefighters' service
        6) Position of elevator
        7) Door status (open, opening, closing, closed)
        8) Door dwell time
        9) Standby power operation/sequence
        10) Door detector
        11) Safety circuit
        12) Door zone
        13) Stop switch
        14) Alarm button
        15) Registered car calls
        16) Out of level
        17) Machine room temperature exceeds 95 degrees
        18) Stop counter (number of starts)
        19) Car speed
        20) Door open times
        21) Door close time
        22) Start to stop motion time
        23) Emergency two-way communication device
        24) Air conditioner/heater
        25) Floor lockouts (car or hall)
        26) Lobby recall
        27) Firefighters' service
        28) Up/down peak
    c. Service Driven Outages:
        1) Independent service
        2) Car out of service
        3) Lobby return, cleaning
    d. Maintenance Activity "Indicators":
        1) Top of car inspection
        2) Hoistway access
        3) Phase I and II
        4) Independent service
        5) Out of service
2. Faults monitored with visual and audible alarm, triggered by combinations of any of the above status points:
    a. Safety circuit

b. Alarm bell
c. Stop switch
d. Emergency two-way communication device
e. Door reversal device
f. At least six user defined faults or events, i.e. water in pit, high machine room/cab temperature
g. Transmit email when any monitored faults occur.

3. If out of service 15 minutes, initiate email to designated address. If fault continues more than eight hours, send email hourly until car returned to service.

F. Reporting Requirements: System shall provide reports in color graphical format both on-screen and in printed form capability to conveniently switch from one report type to another and from one bank to another using minimal mouse clicks and key strokes. Reports shall be displayed after minimal waiting time. Data for all reports shall be continuously recorded and stored. Reports shall be displayed by simply selecting a date and time range, bank of equipment, and report type. Date and time range selections shall carry forward from one report selection to the next. Reporting functions shall be sub-divided into the following categories:

1. Traffic Reports:
   a. Number of hall calls per floor (hall call distribution on a per floor basis)
   b. Number of hall calls per hour (24 hour time-line)
   c. Hall call waiting times per floor (hall call waiting time distribution on a per floor basis)
   d. Hall call waiting times per hour (24 hour time-line)
   e. Distributed hall call response graph (24 hour time-line)
   f. Detailed hall call response graph (% calls / n seconds)
   g. Longest wait times including floor number, wait time, date, time, and direction
2. Fault Reports:
   a. Ten most recent faults (most recent faults listed per bank and per car)
   b. Fault log – displays the entire fault log for a given time period
   c. Faults per car (fault distribution on a per car basis)
   d. Faults per floor (fault distribution on a per floor basis)
   e. Faults per day/week/month (fault distribution on a per unit or group basis)
3. Car Use Statistics:
   a. Car use by hour (24 hour time-line of car calls, car starts, door cycles, delayed car, load by pass)
   b. Car use statistics (same as above, shown for an entire bank)
4. Group Service Log:
   a. Cars in service (24 hour time-line with text log of group availability of each car)
   b. Group functions (24 hour time-line with text log of actuation of group functions: Up peak, down peak, fire service, emergency power).
5. Playback capability: Provide means to playback last fault events:
   a. Provide means to store two years of data, prior to present.
   b. Provide means to search data and display 50 faults in sequence of occurrence.
   c. Provide means to transfer to permanent medium, CD, or approved equal.
   d. Provide means to print out playback data.

G. Motion Control: Microprocessor-based AC type with unit valve suitable for operation specified and capable of providing smooth, comfortable car acceleration and retardation. Limit the difference in car speed between full load and no load to not more than ±10% of the contract speed in either direction of travel.

H. Selective Leveling: Provide means to limit elevator car speed when traveling between adjacent floors.

I. Door Operation: Automatically open doors when car arrives at main floor. At expiration of normal dwell time, close doors. Reopen doors when car is designated for loading. Provide front or rear selective door operation.

J. Standby Lighting and Alarm: Car mounted battery unit with solid-state charger to operate alarm bell and car emergency lighting. Battery to be rechargeable with minimum five-year life expectancy. Include required transformer. Provide constant pressure test button in service compartment of car operating panel. Provide lighting integral with portion of normal car lighting system.

K. Battery Lowering Feature: Upon loss of normal power, provide controls to automatically lower the car(s) to the nearest lower landing. Upon arrival at the lowest landing, the elevator doors shall open automatically and remain open until regular door time has expired. The elevator shall then become deactivated. The standby power source shall be provided via 12-volt D.C. battery units installed in machine room, including solid-state charger and testing means mounted in a common metal container. Battery to be rechargeable lead acid or nickel cadmium with a ten-year life expectancy. Upon restoration of normal power, the elevator shall automatically resume normal operation.

L. Battery Standby Power Pack for Air Conditioner/Heater: Upon loss of normal power, standby power source shall be provided via 12-volt D. C. battery units installed in machine room, including solid-state charger and testing means mounted in a common metal container. Battery to be rechargeable lead acid or nickel cadmium with a ten-year life expectancy. Standby power source shall provide minimum four hours operation.

2.6 MACHINE ROOM EQUIPMENT

A. Arrange equipment in spaces shown on drawings.

B. Pump Unit: Assembled unit consisting of positive displacement pump, induction motor, master-type control valves combining safety features, holding, direction, bypass, stopping, manual lowering functions, shut off valve, oil reservoir with protected vent opening, oil level gauge, outlet strainer, drip pan, muffler, all mounted on isolating pads. Provide oil cooling unit and oil temperature thermostat to maintain oil at operating temperature. Provide Solid State soft start with closed transition. Design unit for 120 up starts/hour.

C. Landing System: Solid-state, magnetic, or optical type.

D. Controller: UL/CSA labeled.
   1. Compartment: Securely mount all assemblies, power supplies, chassis switches, and relays, on a substantial self-supporting steel frame. Completely enclose equipment with covers. Provide means to prevent overheating.
   2. Relay Design: Magnet operated with contacts of design and material to insure maximum conductivity, long life, and reliable operation without overheating or excessive wear. Provide wiping action and means to prevent sticking due to fusion. Contacts carrying high inductive currents shall be provided with arc deflectors or suppressors.
   3. Microprocessor-Related Hardware:

a. Provide built-in noise suppression devices which provide a high level of noise immunity on all solid-state hardware and devices.
b. Provide power supplies with noise suppression devices.
c. Isolate inputs from external devices (such as pushbuttons) with opto-isolation modules.
d. Design control circuits with one leg of power supply grounded.
e. Safety circuits shall not be affected by accidental grounding of any part of the system.
f. System shall automatically restart when power is restored.
g. System memory shall be retained in the event of power failure or disturbance.
h. Equipment shall be provided with Electro Magnetic Interference (EMI) shielding within FCC guidelines.

4. Wiring: CSA labeled copper for factory wiring. Neatly route all wiring interconnections and securely attach wiring connections to studs or terminals.
5. Permanently mark components (relays, fuses, PC boards) with symbols shown on wiring diagrams.
6. Monitoring System Interface: Provide controller with serial data link through RJ45 Ethernet connection and install all devices necessary to monitor items outlined in Section 2.13. Elevator contractor responsible to connect monitoring system interface to machine room monitoring compartment and LAN. Wiring from the LAN to the machine room monitoring compartment by others.
7. Provide controller or machine mounted auxiliary lockable “open” disconnect if mainline disconnect is not in sight of controller and/or machine.
8. Provide control panel compliant with UL 508A SB.SCCR of 5000A required.

E. Muffler: Provide in discharge oil line near pump unit. Design shall dampen and absorb pulsation and noise in the flow of hydraulic fluid.

F. Piping and Oil: Provide piping, connections and oil for the system. Buried piping shall be secondarily contained with watertight Schedule 40 PVC sleeves between elevator machine room and pit, including heat tracing and pipe insulation. Threaded fittings shall be used to connect the steel piping from the power unit to the oil cooler. A minimum of two sound isolation couplings shall be provided between the pump unit and oil line and the oil line and jack unit. Provide isolated pipe stands or hangers as required.

G. Shut-Off Valve: manual ball-type valve on line adjacent to pump unit.

H. Pressure Switch: Provide oil pressure sensitive switch in line to automatically close and prevent loss of oil in cylinder upon loss of pressure in oil supply line.

2.7 HOISTWAY EQUIPMENT

A. Guide Rails: Planed steel T-sections for car of suitable size and weight for the application, including seismic reactions, including brackets for attachment to building structure. Provide rail backing to meet code requirements. Provide bracketing, at top and bottom of floor beams. No additional structural points of rail attachment, other than those shown on the Contract Documents, will be provided.

B. Buffers: Spring type with blocking and support channels.

C. Scavenger Pump: Self-priming and self-lubricating type, with discharge pressure of 200 psi and 90 gph capacity. Include Check Valve and a mesh screen strainer at 200 microns. A float shall be included to prevent operation if the pit is flooded.

D. Hydraulic Jack Assembly:
   1. Cylinders: Seamless steel pipe. Design head to receive unit-type packing and provide means to collect oil at cylinder head and return automatically to oil reservoir. Provide secondary containment/cylinder protection. Provide cylinder stabilizer bracketing between guide rails as required. The piston packing seal shall be changed at the following intervals:

      1) Prior to putting the Car into service for beneficial use
      2) After the 12 month warranty period described in Section 1.8 – 3. above.

   2. Plungers: Polished seamless steel tubing or pipe. If plunger length exceeds 24'-0", provide two or more sections not exceeding 16'-0" in length, or coordinate installation of longer unit at the jobsite. Join sections by internal threaded couplings. Multiple section jack units shall be factory polished while assembled and marked for proper future reassembly. Isolate plunger from car frames.

E. Jack Support and Fluid Shut-Off Valves: Provide steel pit channels to support jack assembly and transmit loads to building structure. Provide intermediate stabilizers as required. Provide manual on/off valves in oil lines adjacent to pump unit and jack units in pit.

F. Well Hole Casing:
   1. Well hole is to be provided by Elevator Contractor. No additional compensation will be allowed for unforeseen conditions of any kind or spoil removal.
   2. Install steel outer casing minimum 18" diameter. Install watertight sleeve over jack assembly for secondary containment prior to insertion into the outer casing. Extend PVC sleeve through pit floor slab to underside of jack support beams and seal with non-permeable membrane. Seal well opening at the pit floor with hydraulic quick setting cement. Provide PVC vision/access ports.

G. Valves:
   1. Provide a pressure sensitive, mechanically-actuated seismic safety valve, conforming to ASME A17.1, Rule 3.19.4.7. Connect valve directly to jack assembly inlet.
   2. Provide Shut-Off Valve, manual ball-type valve on-line adjacent to pump unit.
   3. Provide easily accessible Overspeed Rupture Valve inside the hoistway elevator pit.

H. Terminal Stopping: Provide normal and final devices.

I. Electrical Wiring and Wiring Connections:
   1. Conductors and Connections: Copper throughout with individual wires coded and connections on identified studs or terminal blocks. Use no splices or similar connections in wiring except at terminal blocks, control compartments, or junction boxes. Provide 10% spare conductors throughout. Run spare wires from car connection points to individual elevator controllers in the machine room.
   2. Conduit: Galvanized steel conduit, EMT, or duct. Flexible conduit length not to exceed 3'-0". Flexible heavy-duty service cord may be used between fixed car wiring and car

door switches for door protective devices. Conduit from the closest hoistway of each elevator group or single elevator to the firefighters' control room.

3. Traveling Cables: Flame and moisture-resistant outer cover. Prevent traveling cable from rubbing or chafing against hoistway or equipment within hoistway.
   a. Provide two RG-6/U coaxial CCTV cable and four pair of shielded 18 gauge wire within traveling cable from car controller to car top junction box, plus 3'-0" excess loop at both ends.
   b. Provide two pair of 18 gauge wire for CCTV power.
   c. Provide four pair of spare shielded communication wires in addition to those required to connect specified items.
   d. Tag spares in machine room. Provide cables from controller to car top.
4. Auxiliary Wiring: Provide conduit, wiring and connections for fire alarm initiating devices, emergency two-way communication system, paging speaker, CCTV, digital video display, security system, intercom, and announcement speaker and/or background music from the machine room junction box to each car controller in machine room.

J. Floor Numbers: Stencil paint 4" high floor designations in contrasting color on inside face of hoistway doors or hoistway fascia in location visible from within car.

2.8 HOISTWAY ENTRANCES

A. Complete entrances bearing fire labels from a nationally recognized testing laboratory approved within the governing jurisdiction.

B. Frames: 14 gauge hollow metal at all floors. Mitered and welded head to jamb assembly at all floors. Clad frames with finish material indicated in finish schedule at all floors. Provide Arabic floor designation/Braille plates, centered at 60" above finished floor, on both side jambs of all entrances. Provide plates at main egress landing with "Star" designation. Provide "Star of Life" designation plates at height of 78"-84" above finished floor on both side jambs at all floors. Braille indications shall be below Arabic floor designation. Provide cast floor designation/Braille plates as manufactured by SCS Elevator Products, Inc. or Vision Mark. Provide 14 gauge subframe for special architectural overlay finishes at all floors. Size clear opening of subframes at least 4" wider and 2" higher than clear finish opening.

C. Door Panels: Stainless steel with Glass Panels. Provide leading edges of center-opening doors with rubber astragals. Provide a minimum of two gibs per panel, one at leading and one at trailing edge with gibs in the sill groove entire length of door travel. Construct door panels with interlocking, stiffening ribs. Architectural metal cladding shall wrap around leading and trailing edge of panel and return a minimum of 1/2" on rear side of leading edge of panel at all floors. Provide safety retainers as required by Rule 2.11.11.8 of ASME A17.1.The top and bottom of horizontally sliding doors shall be provided with a means of retaining the door panels in position if the primary guiding means fail, and shall prevent displacement of the door panel (top and bottom) by not more than three fourths of an inch into the hoistway.

D. Entrance Equipment:
   1. Door Hangers: Two-point hanger roller with neoprene roller surface and suspension with eccentric upthrust roller adjustment.
   2. Door Tracks: Bar or formed, cold-drawn removable steel tracks with smooth roller contact surface.
   3. Door Interlocks: Operable without retiring cam. Paint interlock box flat black.

4. Door Closers: Spring, spirator, or jamb/strut mounted counterweight type. Design and adjust to insure smooth, quiet mechanical close of doors.
5. Hoistway Door Unlocking Device: Provide unlocking device with escutcheon in door panel at all floors, with finish to match adjacent surface.

E. Sight Guards: 14 gauge, same material and finish as hoistway entrance door panels. Construct without sharp edges

F. Hoistway Access Switches: Mount in entrance frame side jamb at top and bottom floors. Provide switch with faceplate

G. Sills: Nickel Silver.

H. Sill Supports: Structural or formed steel designed to support door sill based upon car loading classification. Mount to eliminate need for grout under the sill.

I. Toe Guards and Hanger Covers: 14 gauge furniture steel with black enamel finish. Provide toe guards, and hanger covers. Provide car door interlock to prevent opening of car doors outside the unlocking zone.

J. Struts and Headers: Provide for vertical support of entrances and related material. Provide door open bumpers on entrances equipped with vertical struts.

K. Finish of Frames and Doors: Provide welded entrance frames with # 4 finish stainless steel finish.

L. Hoistway Access:
1. Hoistway Door Unlocking Device: Provide unlocking device with locking escutcheon collar in door panel at all floors, with finish to match adjacent surface.
2. Hoistway Access Switches: Mount in entrance frame side jamb at all terminal landings. Provide switch with approved faceplate.

2.9 CAR EQUIPMENT

A. Frame: Welded or bolted, rolled or formed steel channel construction to meet load classification specified.

B. Platform: Isolated type, constructed of steel, or steel and wood which is fireproofed on underside. Design and construct to accommodate load classification requirements. Provide Class “A” construction for passenger elevators. Provide recess to accommodate a minimum 1" floor thickness.

C. Platform Apron: Minimum 14 gauge steel, reinforced and braced to car platform, front and rear with black enamel finish.

D. Guide Shoes: Roller type with three or more spring dampened, sound-deadening rollers per shoe. Maximum roller rotation speed, 350 rpm. Solid type.

E. Finish Floor Covering: Provided:
   1. Rubber tile 1/8" thick with 1" diameter by 0.025 high, raised circular pattern. Color selected by Architect.

F. Sills: One piece extrusion with extruded extension between car entrance columns to face of car front return. Extruded extension to match finish of sill.
   1. Stainless steel.

G. Door Hangers: Two-point hanger roller with neoprene roller surface and suspension with eccentric upthrust roller adjustment.

H. Door Track: Bar or formed, cold-drawn removable steel track with smooth roller contact surface.

I. Door Header: Construct of minimum 12 gauge steel, shape to provide stiffening flanges.

J. Door Electrical Contact: Prohibit car operation unless car door is closed. Provide car door interlock to prevent opening of car doors outside the unlocking zone.

K. Door Clutch: Heavy-duty clutch, linkage arms, drive blocks and pickup rollers or cams to provide positive, smooth, quiet door operation. Design clutch so car doors can be closed, while hoistway doors remain open.

L. Restricted Opening Device: Provide car-door interlock to prevent opening of car doors outside unlocking zone.

M. Door Operator: High-speed, heavy-duty door operator capable of opening doors at no less than 2.5 fps. Accomplish reversal in no more than 2½" of door movement. Provide solid-state door control with closed loop circuitry to constantly monitor and automatically adjust door operation based upon velocity, position, and motor current. Provide a minimum of four controller-activated motion profiles, per floor, per door, to maintain consistent, smooth, and quiet door operation at all floors, regardless of door weight or varying air pressure. Acceptable closed-loop door operators:
   1. KONE: AMD 2.0
   2. Otis: AT 400 - i Motion II (Optional)
   3. Thyssenkrupp: HD91 StarTrac
   4. G.A.L.: MOVFR

N. Door Control Device:
   1. Infrared Reopening Device:
      a. Black, fully enclosed device with full screen infrared matrix or multiple beams extending vertically along leading edge of each door panel to minimum height of 7'-0" above finished floor. Provide additional beams full height of door panels. Device shall prevent doors from closing and reverse doors at normal opening speed if beams are obstructed while doors are closing, except during nudging operation. In event of device failure, provide for automatic shutdown of car at floor level with doors open:
      b. Acceptable Infrared Reopening Device:
         1) Cegard/MAX-154 by CEDES
         2) Gatekeeper by Adams
         3) Magic Edge by Tri-Tronics

4) Microlite by thyssenkrupp
5) Microscan E by T.L. Jones
6) Pana40 Plus by Janus

2. Nudging Operation: After beams of door control device are obstructed for a predetermined time interval (minimum 20.0-25.0 seconds), warning signal shall sound and doors shall attempt to close with a maximum of 2.5 foot pounds kinetic energy. Activation of the door open button shall override nudging operation and reopen doors.
3. Interrupted Beam Time: When beams are interrupted during initial door opening, hold door open a minimum of 3.0 seconds. When beams are interrupted after the initial 3.0 second hold open time, reduce time doors remain open to an adjustable time of approximately 1.0-1.5 seconds after beams are reestablished.
4. Differential Door Time: Provide separately adjustable timers to vary time that doors remain open after stopping in response to calls.
   a. Car Call: Hold open time adjustable between 3.0 and 5.0 seconds.
   b. Hall Call: Hold open time adjustable between 5.0 and 8.0 seconds. Use hall call time when car responds to coincidental calls.

O. Car Operating Panel:
1. Passenger: Two car operating panels with faceplates consisting of a metal box containing the vandal resistant operating fixtures, mounted behind the car stationary front return panel.
   a. Provide manually operated stop switch within Firefighters' Phase II compartment Arrange switch to sound group control panel distress signal when actuated.
   b. Provide "door open" button to stop and reopen doors or hold doors in open position.
   c. Provide "door close" button to activate door close cycle. Cycle shall not begin until normal do
2. Suitably identify floor buttons, alarm button, door open button, door close button, and emergency push-to-call button with approved cast tactile symbols recessed flush mounted fastenings. Configure plates per local building code accessibility standards including Braille. Locate top floor button at maximum height allowed above the car floor; no lower than 35" for emergency push-to-call button and alarm button.
3. Provide minimum 3/4" diameter raised floor pushbuttons that illuminate to indicate call registration.
4. Provide alarm button to ring bell located on car, and sound distress signal at group control panel. Illuminate button when actuated.
5. Provide Firefighters' devices and operation. Install firefighters' telephone jack with approved mounting in firefighter's compartment.
6. Provide lockable service compartment with recessed flush door. Door material and finish shall match car return panel or car operating panel faceplate. Inside surface of door shall contain an integral flush window for displaying the elevator operating permit. Include the following controls in lockable service cabinet with function and operating positions identified by permanent signage or engraved legend:
   a. Inspection switch.
   b. Light switch.
   c. Exhaust blower switch.
   d. Independent service switch.
   e. Constant pressure test button for battery pack emergency lighting.
   f. 120-volt, AC, GFCI protected electrical convenience duplex outlet.
   g. Keyed stop switch.

7. Provide black paint filled (except as noted), engraved, or approved etched signage as follows with approved size and font:
    a. Phase II firefighters' operating instructions on inside face of firefighters' compartment door. Engrave filled red firefighters' operation on outside face of compartment door.
    b. Building identification car number on main and auxiliary car operating panels.
    c. "No Smoking" on main and auxiliary car operating panels.
    d. Car capacity in pounds on main car operating panel.
    e. Loading classification and description on car operating panel.

P. Car Top Control Station: Mount to provide safe access and utilization while standing in an upright position on car top.

Q. Work Light and Duplex Plug Receptacle: GFCI protected outlet at top of car. Include on/off switch and lamp guard. Provide additional GFCI protected outlet on car top for installation of car CCTV.

R. Communication System:
1. Two-way communication instrument in car with automatic dialing, tracking, and recall features, with shielded wiring to car controller in machine room. Provide dialer with automatic rollover capability with minimum two numbers.
    a. Actuate two-way communication via "Help" button.
    b. Button or adjacent light jewel shall illuminate and flash when call is acknowledged.
    c. Button shall match car operating panel pushbutton design.
    d. Provide "Help" button tactile symbol, engraved signage, and Braille adjacent to button mounted integral with car front return panel.
2. Firefighters' communication jack in car and firefighters' panel jack bezel shall match adjacent controls.
3. Install remote speaker(s) provided under Item 1.01. E.1 in car behind front return panel with drilled speaker pattern, with shielded wiring to machine room junction box.
4. Provide two-way communication between car and machine room if required.

2.10 CAR ENCLOSURE

A. Passenger Elevator: Provide complete as specified herein and detailed on architectural drawings.
1. Canopy: Reinforced 12 gauge furniture steel formed panels with lockable, contacted, hinged emergency exit. Interior finish white color reflective baked enamel.
2. Front and Rear Return Panels: Reinforced 14 gauge furniture steel clad with minimum 16 gauge satin finish stainless steel with cutouts for applied car operating panel(s) and other equipment.
3. Transom: Reinforced 14 gauge furniture steel clad with minimum 16 gauge satin finish stainless steel full width of enclosure with cutout for car position indicator.
4. Car Door Panels: Reinforced minimum 16 gauge furniture steel clad with minimum 18 gauge satin finish stainless steel with Glass Panels. Same construction as hoistway door panels. Cladding shall wrap leading and trailing edge of panel a minimum of 1/2" on rear side.
5. Base: Satin finish stainless steel.
6. Interior Wall Finish: Stainless Steel with Glass Panels as specified by the Architect, and in conformance with ANSI Z.97.1.

7. Ventilation: Morrison Products, Inc. three-speed model SOE No. 06-01055 exhaust blower mounted to car canopy on isolated rubber grommets. Exhaust blower shall meet noise and vibration criteria.
8. Lighting: Provide LED fixtures with wiring and hookup. Coordinate with emergency lighting requirements
9. Suspended Ceiling: Coordinate with Architectural Drawings.
10. Handrails: Minimum 1¼" diameter stainless steel tubular grab bar with backing plates and captive nuts across side walls. Special design included in allowance in Interior Wall Finish item above. Bolt rails through car walls from back and mount on 1½" deep solid round stainless steel standoff spacers no more than 18" O.C. Return handrail/guardrail ends to car walls.
11. Pads and Hooks for the Car. Three-piece removable pads. Two pads covering side walls and adjacent front returns and one covering rear wall. Provide cutouts to access main car operating panel.

2.11 HALL CONTROL STATIONS

A. Pushbuttons: Provide one riser with flush mounted faceplates. Include pushbuttons for each direction of travel that illuminate to indicate call registration. Pushbutton design shall match car operating panel pushbuttons. Single riser at typical floors. Provide vandal resistant pushbutton and light assemblies. Provide LED illumination.

B. Phase I Fire Service fixture, including keyswitch, engraved operating instructions and illuminating jewel.

2.12 SIGNALS

A. Car Direction Lantern:
1. Provide flush-mounted car lantern in all car entrance columns .
2. Illuminate up or down LED lights and sound tone once for up and twice for down direction prior to car arrival at floor. Illuminate light until the car doors start to close.
3. Sound level shall be adjustable from 20-80 dBA measured at 5'-0" in front of hall control station and 3'-0" off floor.
4. Provide adjustable car door dwell time to comply with ADA requirements relative to hall call notification time.
5. Provide vandal resistant lantern and light assemblies consisting of series of dots or lines for maximum visibility.

B. Car Position Indicator:

1. In addition to position and direction, the display shall interface with the elevator control system to provide system-based messages for the following conditions at a minimum:
   a. Firefighters' Service, Phase I
   b. Independent Service
   c. Car-to-Lobby Activated

C. Faceplate Material and Finish: Satin finish stainless steel, all fixtures. Tamper resistant fasteners for all fastenings exposed to the public.
1. Car Direction Lantern
2. Car Position Indicator

3. Hoistway Access Switch
4. Phase I Keyswitch Faceplate

D. Floor Passing Tone: Provide an audible tone of no less than 20 decibels and frequency of no higher than 1500 Hz, to sound as the car passes or stops at a floor served.

E. Firefighters' Control Panel: Locate in building fire control room. Fixture faceplate, stainless steel satin finish, including the following features:
1. Car position and direction indicator (digital-readout or color SVGA display type). Identify each position indicator with car number.
2. Indicator showing operating status of car.
3. Manual car standby power selection switches and power status indicators.
4. Two-position firefighters' emergency return switches and indicators with engraved instructions filled red.
5. Firefighters' telephone jack.
6. Fixtures and monitor shall be located as directed by Architect. Where applicable, identify all indicators and manual switches with appropriate engraving. Provide conduit and wiring to control panel. Coordinate size and location with Building Console Supplier.

F. Firefighters' Key Box: Flush-mounted box with lockable hinged cover. Engrave instructions for use on cover per Local Fire Authority requirements.

1. System Performance Monitoring:
   a. Hall call registration information: Provide memory capacity for at least the preceding five, 24-hour periods, in blocks of 5- or 15-minute segments, running hour to hour (i.e., 2:00 p.m. to 3:00 p.m.)
      1) Visual and printed summary of hall call registration events by floor, direction, and duration, totaled in 5- or 15-minute segments during any 60-minute block using an internal clock.
      2) Visual and printed summary of hall call registration duration averaged for 5- or 15-minute and hourly periods.
      3) Visual and printed summary of percentage of hall calls answered within 30 and 60 seconds in each 5- or 15-minute and hourly periods.
      4) Visual and printed summary of time periods during which individual cars are not in group operation (operating separately or out of service).
   b. Accumulate system fault data including nature of fault, time, and day. Store and retrieval capabilities for minimum 30-day period.
2. Provide printer to produce a hard copy of stored data. Provide directions and software to accomplish information retrieval.

2.13 INTERCOM AND DISTRESS SIGNAL SYSTEM

A. General: Provide intercommunication system for Car. Include all wiring between elevator hoistways and control panels. Include the following stations:

Station Location	Type Station	Selection Buttons to Call
Elevator Machine Room	Master	Control Panel
Lobby Control Panel	Master	Machine Room
Firefighters' Control Panel	Master	Machine Room
Elevator	Remote	Liftnet Monitoring Station

B. Basic Equipment:
1. Amplifier providing static-free voice transmission with adequate volume and minimum distortion at all stations, with pre-amplifier capable of receiving voice and music inputs from building and emergency building communication system.
2. Activation of emergency building communication system overrides all other conversations and permits one-way conversation to all master stations in system.
3. Master Stations:
   a. Speaker-microphone combination and/or handset for two-way communication.
   b. Selection buttons to enable communication with all master stations. Maintain continual reception of hands-free reply from station when a selected button is depressed.
   c. Two-Position "Talk/Listen" Button: Press to talk; release to listen.
   d. Illuminate "in use" light when any master station is being used.
   e. Reset button to make system available for use by any master station.
   f. Volume control knob for adjustment of incoming volume.
   g. Button to establish communications with all stations.
   h. Distress light in lobby panel which illuminates when "push to call" button or alarm button in car is actuated. Energize distress light and buzzer or chime until intercom selection button for that car has been depressed. Sound buzzer or chime in lobby panel simultaneously with illumination of distress light.
4. Remote Stations:
   a. Station in car shall be activated by "push to call," two-way communication button. "Push to call" button shall illuminate and flash when call is acknowledged. Button shall match car operating panel pushbutton design. Provide uppercase "PUSH TO CALL," "HELP ON THE WAY" engraved signage adjacent to button. Provide "push to call" button tactile symbol, engraved signage, and Braille adjacent to button.
   b. Locate car microphone and speaker, or transceiver/speaker combination behind front return panel.

C. Station Housings:
1. House master station in machine room in a metal compartment with baked enamel finish. Attach to the group elevator supervisory control panel or wall mount. Provide communication handset with 25'-0" long cord.
2. Provide control center master intercoms with stainless steel satin finish faceplates and engraved operating instructions. Coordinate faceplate size and installation of units with building Console Supplier.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to beginning installation of equipment examine hoistway and machine room areas. Verify no irregularities exist which affect execution of work specified.

B. Do not proceed with installation until work in place conforms to project requirements.

3.2 INSTALLATION

A. Install all equipment in accordance with Contractor's instructions, referenced codes, specification, and approved submittals.

B. Install machine room equipment with clearances in accordance with referenced codes and specification.

C. Install all equipment so it may be easily removed for maintenance and repair.

D. Install all equipment for ease of maintenance.

E. Install all equipment to afford maximum accessibility, safety, and continuity of operation.

F. Remove oil, grease, scale, and other foreign matter from the following equipment and apply one coat of field-applied machinery enamel.
   1. All exposed equipment and metal work installed as part of this work which does not have architectural finish.
   2. Machine room equipment, hoistway equipment including guide rails, guide rail brackets, and pit equipment.
   3. Neatly touch up damaged factory-painted surfaces with original paint color. Protect machine-finish surfaces against corrosion.

G. Clean all architectural finishes and replace or restore any surfaces damaged during construction to like new condition.

H. Final payment, for retainage of 10%, shall not be made for the installation work prior to the conclusion of the Warranty / Maintenance period.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Operating Test: Load elevator to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machine during 30-minute test period. Record failure to perform as required.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 ADJUSTING

A. Install hydraulic jack assembly and guide rails plumb and align vertically with tolerance of 1/16" in 100'-0". Secure guide rail joints without gaps and file any irregularities to a smooth surface.

B. Lubricate all equipment in accordance with Contractor’s instructions.

C. Adjust motors, valves, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks, and safety devices to achieve required performance levels.

3.5 CLEANUP

A. Keep work areas orderly and free from debris during progress of project. Remove packaging materials on a daily basis.

B. Remove all loose materials and filings resulting from work.

C. Clean machine room equipment and floor.

D. Clean pit equipment and floor.

E. Clean hoistways, car, car enclosure, entrances, operating, and signal fixtures.

3.6 TEST RESULTS:

A. Under any load obtain specified contract speed, performance times, stopping accuracy without re-leveling, and ride quality to satisfaction of Consultant. Tests may be conducted under no load, balanced load, and full load conditions.

B. Consultant may test temperature rise in motor windings limited to 50° Celsius above ambient. A full-capacity one hour running test, stopping at each floor for ten seconds in up and down directions, may be required.

C. Engage a factory-authorized service representative to train Owner’s maintenance personnel to operate, adjust, and maintain elevators.

D. Check operation of each elevator with Owner’s personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.
   1. Engage Elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items which cannot be refinished in the field to the shop, make required repairs, and refinish entire unit, or provide new units as required.

END OF SECTION

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Copper Pipe and Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-plated steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.3 MATERIALS

A. Carbon Steel: ASTM A 1011/A 1011M.

B. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

C. Stainless Steel: ASTM A 240/A 240M.

PART 3 - EXECUTION

3.1 APPLICATION

A. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

C. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

D. Install lateral bracing with pipe hangers and supports to prevent swaying.

E. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

F. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

G. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields piping. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

    1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780/A 780M.

3.5 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

D. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general indoor applications.

E. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

F. Use thermal-hanger shield inserts for insulated piping and tubing.

G. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
2. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

H. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. C-Clamps (MSS Type 23): For structural shapes.

I. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

J. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

K. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Refrigerant suction and liquid piping, indoors and outdoors.

B. Related Sections:

1. Section 23 07 16 "HVAC Equipment Insulation."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
3. Detail application of field-applied jackets.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

D. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

2.2 ADHESIVES

A. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

B. PVC Jacket Adhesive: Compatible with PVC jacket.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

2.4 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. PVDC Jacket for Indoor Applications: 4-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

6. PVDC Jacket for Outdoor Applications: 6-mil-thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Adhesive: As recommended by jacket material manufacturer.
2. Color: White.
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Sheet and roll stock ready for shop or field sizing.
2. Finish and thickness are indicated in field-applied jacket schedules.
3. Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene and kraft paper.
4. Moisture Barrier for Outdoor Applications: 2.5-mil-thick polysurlyn.
5. Factory-Fabricated Fitting Covers:

    a. Same material, finish, and thickness as jacket.
    b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    c. Tee covers.
    d. Flange and union covers.

e. End caps.
f. Beveled collars.
g. Valve covers.
h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.7 TAPES

A. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

2.8 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with closed seal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings:

1. Install insulation over fittings with continuous thermal and vapor-retarder integrity.
2. Insulate pipe elbows using fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.8 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

3.9 INDOOR PIPING INSULATION SCHEDULE

A. Condensate Piping: Flexible elastomeric, 3/4 inch thick.

B. Refrigerant Suction and Liquid Piping: Flexible elastomeric, 1 inch thick.

C. Refrigerant Suction and Liquid Flexible Tubing: Flexible elastomeric, 1 inch thick.

3.10 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Liquid Piping: Insulation shall be the following:

1. Flexible Elastomeric: 1 inches thick.

B. Refrigerant Suction and Liquid Flexible Tubing: Insulation shall be the following:

1. Flexible Elastomeric: 1 inches thick.

3.11 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Refrigerant Piping:

1. Aluminum, Stucco Embossed: 0.020 inch thick.

END OF SECTION

SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes pipe and fitting materials and joining methods for the following:

1. Copper pipe and fittings.
2. Joining materials.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Pipe.
2. Fittings.
3. Joining materials.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1. Condensate-Drain Piping: 150 deg F; 125 psig working pressure.

2.2 COPPER TUBE AND FITTINGS

A. DWV Copper Tubing: ASTM B 306, Type DWV.

B. Wrought-Copper Unions: ASME B16.22.

2.3 JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

B. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Condensate-Drain Piping: Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

C. Install piping at indicated slopes.

D. Install piping free of sags and bends.

E. Install fittings for changes in direction and branch connections.

F. Install piping to allow application of insulation.

G. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

H. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

3.3 HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.

D. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

END OF SECTION

SECTION 23 23 00 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Refrigerant pipes and fittings.
2. Refrigerants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve, refrigerant piping, and refrigerant piping specialty.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8/A5.8M.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Working Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.3 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Arkema Inc.
b. DuPont Fluorochemicals Div.
c. Genetron Refrigerants; Honeywell International Inc.
d. Mexichem Fluor Inc.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Liquid Lines and Suction Lines for Heat-Pump Applications: Copper, Type ACR, tubing and wrought-copper fittings with brazed or soldered joints.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection.

L. Install refrigerant piping in protective conduit where installed belowground.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal suction lines with a uniform slope downward to compressor.
2. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

3.3 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

3.4 HANGERS AND SUPPORTS

A. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Spring hangers to support vertical runs.
3. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:

1. NPS 1/2: Maximum span, 60 inches; minimum rod, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod, 1/4 inch.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.6 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
2. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.

END OF SECTION

SECTION 23 81 26 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: One year(s) from date of Substantial Completion.
b. For Parts: One year(s) from date of Substantial Completion.
c. For Labor: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Corporation; a unit of United Technologies Corp.
2. Mitsubishi Electric & Electronics USA, Inc.

3. Samsung HVAC.
4. Trane.
5. YORK; a Johnson Controls company.

2.2 INDOOR UNITS (5 TONS OR LESS)

A. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:

    a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
    b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    c. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
    d. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

5. Air Filtration Section:

    a. General Requirements for Air Filtration Section:

        1) Comply with NFPA 90A.
        2) Minimum MERV according to ASHRAE 52.2.
        3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

    b. Disposable Panel Filters:

        1) Factory-fabricated, viscous-coated, flat-panel type.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

    a. Compressor Type: Scroll.

b. Refrigerant: R-410A.
c. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 12 deg F.
7. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection including auto setting.
5. Automatic changeover between heating and cooling modes.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

D. Drain Hose: For condensate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in contract documents.
2. Install ground-mounted, compressor-condenser components on polyethylene mounting base.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for basic electrical studies and reports, material handling, and other basic electrical materials and methods.

B. Related Sections:
   1. Division 01 – General Requirements.
   2. Division 09 – Finishes
   3. Division 23 – Heating Ventilating and Air Conditioning (HVAC)
   4. Division 26 – Electrical
   5. Division 27 – Communication
   6. Division 28 – Fire Alarm

1.2 REFERENCES

A. America National Standards Institute (ANSI):
   1. ANSI Z535.4, Product Safety Signs and Labels.

B. American Society of Mechanical Engineers (ASME):
   1. ANSI/ASME Y14.2M, Line Conventions and Lettering.
   2. ANSI/ASME Y14.24M, Types and Applications of Engineering Drawings.
   3. ANSI/ASME Y14.34M, Associated Lists.
   4. ANSI/ASME Y14.35M, Revision of Engineering Drawings and Associated Documents.
   5. ANSI/ASME Y14.100, Engineering Drawing Practices.

C. Institute of Electrical and Electronic Engineers (IEEE):
   1. ANSI/IEEE 18, Standard for Shunt Power Capacitors.
   2. ANSI/IEEE 141, Recommended Practice for Electric Power Distribution for Industrial Plants - Red Book.
   3. ANSI/IEEE 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems - IEEE Buff Book.
   4. ANSI/IEEE 399, Recommended Practice for Power Systems Analysis - Brown Book.
   5. ANSI/IEEE 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
   6. IEEE 1036, Guide for Application of Shunt Power Capacitors.
   7. ANSI/IEEE 1584, Guide for Arc-Flash Hazard Calculations.
   8. ANSI/IEEE C37.10, Guide for Diagnostics and Failure Investigation of Power Circuit Breakers.
   9. ANSI/IEEE C37.13, Low-Voltage AC Power Circuit Breakers Used in Enclosures.
   10. ANSI/IEEE C57.12.00, General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers.

11. ANSI/IEEE C57.12.59, Standard for Dry-Type Transformer Through-Fault Current Duration

D. InterNational Electrical Testing Association, Inc. (NETA):
1. ANSI/NETA ETT Standard for Certification of Electrical Testing Technicians.

E. National Electric Manufacturer's Association (NEMA).
1. ANSI/NEMA MG 1, Motors and Generators.
2. NEMA ICS 6, Industrial Control and Systems: Enclosures.

F. National Electrical Contractors Association (NECA)
1. ANSI/NECA 100 Symbols for Electrical Construction Drawings.

G. National Fire Protection Association (NFPA):
1. NFPA 70, National Electrical Code (NEC).
2. NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces.

H. The Society for Protective Coatings (SSPC):
1. SSPC-SP 2, Hand Tool Cleaning.

I. Other Published References:
1. Electrical Safety Handbook, by John Cadick, McGraw Hill, Inc., Article on Safety Electrical One-Line Diagrams.

1.3 DEFINITIONS

A. PCC: Point-of-Common-Coupling, which occurs at terminals to which both harmonic producing loads, such as variable speed drives, and non-harmonic producing loads are connected.

B. THD: The Total Harmonic Distortion of the electrical system, including the effects of all harmonics.

C. UPS: Uninterrupted power supply, usually an independent electrical power supply designed to provide power when normal electrical service is interrupted.

1.4 SUBMITTALS

A. Submit the following information for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
1. Product Data:
a. Submit Product Data, including catalog cuts, for all products provided for the electrical work of this Contract and as specified in other Sections.
1) Clearly indicate the usage of each product on each submittal.
2. Shop Drawings:
a. Submit Shop Drawings for the electrical work of this Contract as specified in other Sections.
3. Quality Control Submittals:
a. Motor Overload Relay and Branch Circuit Overcurrent Protective Device Schedule.

b. As-Built Electrical Operating Diagrams:
   1) Hard copies for approval.
   2) CD ROM disc in AutoCAD (dwg) or Adobe (pdf) format.
c. Certificates:
   1) Testing agency quality verification that all products meet requirements or manufacturer disclaimer statements.
d. Qualification Statements:
   1) Testing agency qualifications.

1.5 SUBSTITUTIONS, BASIS OF DESIGN, AND ACCEPTABLE MANUFACTURERS

A. All substitutions to identified materials or equipment shall comply with the applicable requirements of Division 1. In any case of conflict between such requirements of Division 1 and this paragraph, the more stringent requirements shall govern.

B. Whenever an item of material or equipment is identified by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function and quality required. Unless the identification or description contains or is followed by words reading that no like, equivalent or "or- equal" item or no substitution is permitted, material or equipment of other Suppliers may be proposed.

C. Where substitutions to identified items are permitted, any proposed substation or alternate must fully comply with the following in order to be considered by Metro North Railroad:
   1. Be of a reputable manufacturer,
   2. Be fully compliant with the requirements of this Section and the Drawings,
   3. Be fully compatible with all interfacing items and work, and with the installation environment,
   4. Be appropriate (as determined by Metro North Railroad) for the proposed application, and
   5. Be equivalent (as determined by Metro North railroad) in character, performance, and quality to any identified Basis of Design.

D. Where a specific manufacturer or product is identified as the Basis of Design or listed first in a list of acceptable manufacturers, the overall project design is based on the identified manufacturer or product. If the Contractor elects to substitute a manufacturer or product which differs from the identified Basis of Design, the Contractor shall bear all efforts and costs of any design changes necessary in order to achieve finished work which is equal in character, performance, and quality to the original design depicted in the Contract Documents. Such changes shall include, but not necessarily be limited to: changes to ratings and/or features of other equipment, changes to material sizes and/or types, new material and/or equipment, and changes to structural and/or architectural features (including room sizes). Approval by Metro North Railroad of a proposed substitute item shall not relieve the Contractor of this responsibility.

E. The listing of specific manufacturers is solely intended to identify reputable manufacturers who are known to provide quality products of the general type specified. Such listing is in no way intended to imply that the identified manufacturers product(s) have been verified to satisfy the specified requirements, or to be equivalent to any identified Basis of Design manufacturer. Nor does such a listing imply acceptance of products which do not meet the specified requirements, ratings, features, dimensions, and functions as indicated.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Testing Agency Qualifications:
      a. Use a NETA accredited testing agency, or approved equal, that is accredited for the region in which the Contract work is performed.
      b. Submit the testing agency's qualifications to the Engineer for approval.

B. Regulatory Requirements:
   1. Perform all electrical work in conformance with the requirements of NFPA 70, the National Electrical Code.

C. Certifications:
   1. Submit evidence with all Product Data that the products represented meet testing agency quality verification requirements, including agency listing and labeling requirements.
      a. Such evidence may consist of either a printed mark on the data or a separate listing card.
      b. Submit a written statement from those product manufacturers that do not provide evidence of the quality of their products that indicates why an item does not have quality assurance verification.
         1) Such statements provided in lieu of quality assurance verification are subject to the acceptance of Metro North Railroad.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and equipment to the work site in accordance with the requirements of this section.
   1. Deliver materials and equipment in a clean condition.
      a. Provide packaging that plugs, caps, or otherwise seals openings both during shipping and temporary storage.
   2. Provide equipment needed for unloading operations, and have such equipment on the work site to perform unloading work when the material and equipment is delivered.
      a. If possible, clearly identify pick-points or lift-points on electrical equipment crating and packaging.
      b. In the absence pick-points or lift-points on equipment crating and packaging, identify pick-points or lift-points on the equipment itself.

B. Handle materials and equipment in accordance with the requirements of this section.
   1. Handle materials and equipment in accordance with manufacturer's written instructions.
   2. When unloading materials and equipment, provide special lifting harnesses or apparatus as required by manufacturers.

C. Store electrical materials and equipment, whether on-site or off-site, in accordance with the following:
   1. Follow the manufacturer's written instructions for storing the items.
   2. Store electrical equipment and products under cover.
      a. Except for electrical conduit, store electrical equipment and products in heated warehouses or enclosed buildings with auxiliary heat and that provide protection from the weather on all sides.

1.8 SYSTEM STARTUP

A. Energize the following items in the presence of a Metro North Railroad representative:
   1. Process instrumentation.
   2. Equipment rated over 1-horsepower.

B. Startup the following items in the presence of a Metro North Railroad representative:
   1. Instrumentation.
   2. Process equipment.

1.9 MAINTENANCE

A. Operation and Maintenance Manuals:
   1. Prepare Operation and Maintenance Manuals in conformance with the requirements of Metro North, other Contract requirements, and as follows:
      a. Organize Operation and Maintenance Manuals by Specification Section and equipment number as designated on the Contract Drawings.
      b. Include suppliers, supplier addresses, and supplier telephone numbers for the equipment and products furnished.
   2. 60 days prior to the request for final payment, prepare and submit two copies of the proposed Operation and Maintenance Manuals to Metro North Railroad for approval.
   3. Upon approval of the proposed Operation and Maintenance Manuals, submit six corrected copies to Metro North Railroad.
   4. Insert final record drawings in each set of Operation and Maintenance Manuals at Project Closeout.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Grounding and Bonding Materials:
   1. Provide grounding and bonding materials in accordance with the requirements of Section 26 05 26.

B. Hangers and Supports:
   1. Provide hangers and supports for electrical equipment in accordance with the requirements of Section 26 05 28.

C. Electrical Identification Materials:
   1. Provide electrical identification materials in accordance with the requirements of Section 26 05 53.

D. Wire and Cable:
   1. Provide medium-voltage electrical wire, cable, and accessories in accordance with the requirements of Section 26 05 13
   2. Provide low-voltage electrical wire, cable, and accessories in accordance with the requirements of Section 26 05 19.

E. Conduit and Raceway:
1. Provide conduit and raceway as indicated, as appropriate for the application per NFPA 70, and in accordance with the following:
a. Conduit and Tubing: Provide electrical conduit and tubing in accordance with the requirements of Section 26 05 33.13.
b. Surface Raceway: Provide electrical surface raceway in accordance with the requirements of Section 26 05 33.16.

F. Wiring Devices:
1. Provide electrical wiring devices in accordance with the requirements of Section 26 27 26.

2.2 SHOP FINISHING

A. For electrical equipment, factory-apply paint and coating systems that at a minimum meet the requirements of the NEMA ICS 6 corrosion-resistance test and the additional requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 POSTING OF ELECTRICAL SAFETY OPERATING DIAGRAMS

A. Provide a 24” x 36” hard paper copy of the Electrical Safety Operating Diagram to Metro North Railroad.

3.2 INSTALLATION

A. Field-Applied Finishes:
1. Except for factory-finished items that have been completely finished with factory-applied primer and final finish coatings, finish installed electrical materials, equipment, apparatus, and items in the field in accordance with the requirements of Section 09 90 00.
a. Apply paint material matching the composition of the factory-applied products.
1) Obtain factory-supplied paint for this work whenever available.
b. Comply with the paint manufacturer’s instructions for mixing, thinning, surface preparation, application, spreading rate, drying time, and environmental limitations concerning application of the paint.
c. Apply paint in such a manner so that the finished appearance will match as nearly as possible the factory finish.
1) Poorly applied paint may be required to be repaired and re-applied by the Contractor in accordance with Article 3.02 at no additional cost to Metro North Railroad.
2. Coordinate the painting of large areas with Metro North Railroad to minimize the duration of exposure of other workers to toxic paint fumes.

3.3 REPAIR/RESTORATION

A. If the factory finish of factory-finished items is damaged for any reason, refinish the item.
   1. If an item that has several surfaces has damage on one surface, refinish the entire damaged surface.
      a. Surface Preparation:
         1) Outside the damaged area, lightly sand the entire surface and perform additional sanding to profile the damaged paint edge.
         2) Prepare the surfaces of damaged areas in accordance with SSPC-SP 2.

3.4 FIELD QUALITY CONTROL

A. Perform electrical testing as detailed in Section 26 05 63 and in each Specification Section.

B. Have electrical work inspected as required by the local Authority Having Jurisdiction (AHJ).
   1. Submit the certification of inspection with the final project closeout documents to Metro North Railroad.

C. The quality of finishing and refinishing work is subject to approval by Metro North Railroad.

3.5 MANUFACTURERS' FIELD SERVICES

A. Provide the services of a qualified field engineer and necessary tools and equipment to test, calibrate, and adjust the protective relays and circuit breaker trip devices as recommended in the Final Project Report of the power system study.

END OF SECTION

SECTION 26 05 03 - EQUIPMENT WIRING CONNECTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: The work specified in this Section consists of services and work of an administrative nature as well as general requirements concerning certain products and operations, all common to the entire Division 26 Sections.

B. Related Sections:
   1. Division 26 Sections as Included.
   2. Other Divisions, as applicable.

1.2 ELECTRICAL INTERFACE

A. This Section of the Specifications is provided for clarification of the responsibilities of this Contract with regard to the connection of equipment provided under other Divisions of this Contract.

B. Unless specifically indicated otherwise, the electrical components or equipment, which are furnished as part of other Contracts, will be installed, including final connections, as work of those Contracts.

C. Power and field-required control interconnection wiring and conduits, including final connections of such to the electrical components of the equipment and controls, as specified within this Division of the Contract or as indicated on the Drawings, shall be performed as work of Division 26 - Electrical.

D. Refer to Specification Section 26 05 00 Common Work Results for Electrical for works to be provided by MNR Power Department.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Basic electrical materials required for the work to be included in this Section are as specified in other Sections of these Specifications and as shown on the Drawings.

2.2 COORDINATION

A. Electrical Equipment:

B. Unless otherwise indicated, this Contractor will provide the required safety disconnect devices, motor starters, variable frequency drives and all other electrical appurtenances, as indicated on the Drawings, for the connection and operation of all electrical equipment included in this project.

C. Mechanical Equipment:
   1. Unless otherwise indicated, mechanical equipment control panel(s) will be provided as part of the work of other Contracts.
   2. Coordinate the installation of all field wiring with the respective Contract furnishing the equipment and with the approved shop drawings for the item being connected.
   3. Electrical Contractor will provide only power to respective control panel.
   4. Approved shop drawings indicating the required wiring connections will be provided by the respective Contract responsible for furnishing the equipment.

PART 3 - EXECUTION

3.1 GENERAL

A. Electrical materials being installed for the connection of equipment shall be installed as specified in the applicable sections of these Specifications, and as indicated on the Drawings.

3.2 EQUIPMENT WIRING

A. General: Refer to the Drawings for the electrical field wiring required for this Contract.

B. Electrical Elevator and Mechanical Equipment Installation:
   1. Provide required wiring to items of equipment as indicated on the Drawings.

C. Provide interconnection wiring between control panels, control devices, motor starters and branch circuit panelboards/motor control centers, as indicated on the Drawings, and as required for an operational system.

D. Conduit Installation for Roof-Mounted Equipment:
   1. Roof penetrations shall be made prior to application of roofing materials.
   2. Coordinate the time of roof penetration of conduits with the roof work of the General Construction Work to permit simultaneous roof restoration work.
   3. Run wiring to roof mounted equipment and interconnecting wiring between roof mounted and interior equipment through wiring channels in roof curbs when such are provided for the roof mounted equipment installed under other Contracts.
   4. Conduit flashing and roof restoration work involved with conduits passing through the roof (if any) to roof mounted equipment of other Contracts shall be performed as work of the other Contracts.

END OF SECTION

SECTION 26 05 19 LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, connecting, energizing, testing, cleaning, and protecting low voltage cable, shielded cable, and accessories.

B. Related Sections:
   1. Section 01 33 00 - Submittal Procedures.
   2. Section 26 05 00 - Common Work Results for Electrical
   3. Section 26 05 26 - Grounding and Bonding.
   4. Section 26 05 53 - Identification for Electrical Systems.
   5. Section 26 05 63 - Acceptance Testing for Electrical Systems.
   6. Section 26 05 33.16 - Boxes for Electrical Systems

1.2 REFERENCES

A. American Society for Testing Materials (ASTM):
   1. ASTM B 8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

B. Institute of Electrical and Electronic Engineers (IEEE):
   1. IEEE 383 - Standard for Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations.
   2. IEEE 1202 - Standard for Flame-Propagation Testing of Wire and Cables.

C. National Electrical Manufacturer's Association (NEMA):
   1. NEMA WC 26/EEMAC 201 - Binational Wire and Cable Packaging Standard.
   2. ANSI/NEMA WC 57 - Standard for Control, Thermocouple Extension, and Instrumentation Cables.

D. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code (NEC).

E. Underwriter's Laboratories, Inc. (UL):
   1. UL 13 - Standard for Power-Limited Circuit Cables.
   2. UL 1277 - Standard for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.
   3. UL 1569 - Standard for Metal-Clad Cables.
   4. UL 1581 - Reference Standard for Electrical Wires, Cables, and Flexible Cords.
   5. UL 1685 - Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables.
   6. UL 2250 - Standard for Instrumentation Tray Cable.

F. Insulated Cable Engineers Association (ICEA):
1. ICEA T-29-520 - Vertical Cable Tray Flame Test @ 210,000 BTU.

1.3 SUBMITTALS

A. Submit the following information to the Engineer for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
1. Product Data:
a. Wires and cables.
b. Lugs
c. Connectors.
d. Tape.
e. Pulling lubricant.
2. Samples:
a. Wire samples.
3. Quality Assurance/Control Submittals:
a. Design Data.
1) Tension cable pulling calculations for all underground power runs.
b. Certificates.
1) Testing agency/quality verification.
c. Manufacturer's Instructions.
1) Cable manufacturer's recommendations.
d. Qualification Statements.
1) Documented experience of the installing firm.
2) Qualifications of the licensed electricians supervising the Work.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Installer Qualifications:
a. To install the Work of this Section, employ the services of a firm specializing in installing wire, cable, and accessories, and that has a minimum of 3 years experience doing so.
1) Submit the documented experience of the firm installing the wire, cable, and accessories.
b. To supervise installation of the Work of this Section, employ licensed electricians.
1) Submit the qualifications of the licensed electricians supervising the Work of this Section.

B. Regulatory Requirements:
1. Perform the Work of this Section in accordance with the requirements specified in NFPA 70, and to all other applicable state, local, and national governing codes and regulatory requirements.

C. Certifications:
1. Provide products that are listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location installed in, and the application intended, unless

products meeting the requirements of these testing laboratories are not available or unless standards do not exist for the products.
   a. Provide copper conductors listed and labeled by UL for all wiring.
2. Submit evidence of testing agency/quality verification, listing, and labeling for each product with the submitted product data either by providing a printed mark on the data or by attaching a separate listing card.
   a. For items without such evidence, submit a written statement from the product manufacturer that indicates why it does not have quality assurance verification.

D. Field Samples:
1. Submit one 36-inch long sample of each type of wire to be used.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
1. Imprint insulated conductors with the date of manufacture, the wire type, and the manufacturer.
2. Package wire and cable in conformance with the requirements of NEMA WC 26/EEMAC 201.
3. Protect items from damage during delivery, handling, and installation.
   a. Comply with the cable manufacturer's recommendations for inspection, handling, storage, temperature conditioning, bending and training limits, pulling limits, and calculation parameters for installing cable.
   b. Submit the cable manufacturer's recommendations for inspection, handling, storage, temperature conditioning, bending and training limits, pulling limits, and calculation parameters for installing cable.

B. Acceptance at Site:
1. Wire and cable manufactured more than 12 months before delivery to the Site is unacceptable for use under this Contract, and will be rejected.

C. Storage and Protection:
1. Store products indoors on blocking or pallets.
2. Protect items from damage during storage.

1.6 PROJECT ENVIRONMENTAL REQUIREMENTS

A. Install armored instrumentation cable only when the temperature is above -40 degrees Celsius.

1.7 MAINTENANCE

A. Operation and Maintenance Manuals:
1. Include product data for the products provided as the Work of this Section in the Operation and Maintenance Manuals submitted with the record drawings at project closeout in accordance with Metro North standards.

PART 2 - PRODUCTS

2.1 LOW VOLTAGE CONDUCTORS

A. Conductor Design Requirements:
1. Provide conductors of the proper size and ampacity ratings based on Article 310 of NFPA 70.
   a. Provide copper conductors that have 98 percent conductivity for 600 volts.
   b. Unless otherwise indicated on the Contract Drawings, at a minimum provide conductors of the following American Wire Gauge (AWG) sizes:
      1) For power and branch feeder circuits: 12 AWG.
         a) For power and branch feeders, provide solid or stranded copper low-voltage conductors for sizes up to and including 10 AWG, provide stranded copper low-voltage conductors for 8 AWG and larger sizes.
      2) For control circuits: 14 AWG.
      3) For alarm and status circuits: 14 AWG.
      4) For single conductor instrument wiring: 14 AWG.
      5) For multiple conductor instrument wiring: 16 AWG.

B. Insulation Design Requirements:
1. Provide low voltage ground, power, and control wiring having the proper insulation types as follows:
   a. For interior and exterior, dry, wet, and damp locations, including NEMA 4X locations: Type XHHW-2.
   b. For underground wiring:
      1) For sizes 14 AWG through 10 AWG: Type XHHW-2.
      2) For sizes 8 AWG and larger: Type RHW-2 or XHHW-2.
      3) Un utility 120/208 service conductors shall be type USE-2/RHW-2
   c. For ground wires: THW may be used at the Contractor's option.

2. Color Coding of Wires
   a. Insulation shall be factory colored per Tables 16122-1, 16122-2 and/or 16122-3 below. The use of tape for color coding is prohibited.

C. Manufacturers
1. Acceptable Manufacturers:
   a. Continental Wire & Cable Company
   b. SouthWire
   c. General Cable
   d. Okonite Co.
   e. Or Approved Equal

2.2 MATERIALS

2.3 ACCESSORIES

A. Cable Lubricant:

1. Provide cable lubricant specifically recommended by the cable manufacturer for cable pulling operations.
    a. For rubber of plastic jacketed cables, provide soapstone, graphite, or talc cable lubricant.

B. Grounding Braid:
1. Provide conformable, all-metal (tinned copper wires), corrosion resistant, woven grounding braid having a high current-carrying capacity approximately that of 6 AWG wire, such as.
2. Manufacturers:
    a. 3M, Scotch, Scotch® 25 Electrical Grounding Braid,
    b. Plymouth
    c. Permacel
    d. Or Approved Equal.

C. Tapes:
1. Arc Proofing Tape:
    a. Provide fire retardant arc proofing tape, such as Scotch® 77 Fire Retardant Electric Arc Proofing Tape, that is capable of protecting cables from fault arc generated heat and flames and of protecting adjacent wrapped cables and accessories exposed to fault arcs until limiting devices can interrupt the faulted circuit.
2. Vinyl Insulating Tape:
    a. Provide UL-listed flexible polyvinyl chloride (PVC) backed insulating tape with a pressure sensitive adhesive, such as black Scotch® 33+ Vinyl Electrical Tape, that is resistant to abrasion, acids, alkalis, and copper corrosion; resistant to, hot, cold and wet weather; and resistant to damage from UV sunlight exposure.
3. Rubber Splicing Tape:
    a. Provide highly conformable, linerless, self-bonding, ethylene rubber (EPR), high-voltage (through 69 kV) insulating tape formulated to provide excellent thermal dissipation of splice heat, and designed to insulate splices and terminate cables whose overload temperatures can reach 130 degrees Celsius, such as Scotch® 130C Linerless Rubber Splicing Tape.
4. Manufacturers:
    a. 3M, Scotch
    b. Plymouth
    c. Permacel
    d. Or Approved Equal.

D. Tubing:
1. Heat Shrinkable Tubing:
    a. Provide flexible, flame retardant, polyolefin heat shrinkable thin wall tubing that has good resistance to common fluids and solvents, and has a high dielectric strength.
2. Waterproof Splice Kits:
    a. Provide heat shrinkable thin wall polyolefin electrical cable splice kits.
3. Manufacturers:
    a. Tyco Electronics, CGPT
    b. Thomas & Betts Corp.
    c. Or Approved Equal.

E. Wire and Cable Connections:
1. Grounding Connectors:
a. Provide grounding connectors conforming to the requirements of Section 26 05 26, Grounding and Bonding.
2. Connectors for Service Wires and Cables, and for Wires and Cables Larger Than Number 6:
a. Split Bolt Connectors or Compression Type Connectors:
1) Provide UL-listed split bolt connectors or compression type connectors for making parallel or butt splices of stranded copper wire.
2) Use companion preformed plastic insulating covers or tape insulation conforming to NFPA 70 (NEC) requirements.
b. Mechanical compression connectors:
1) Provide mechanical compression connectors that are capable of connecting single or multiple conductors, and of being installed with one wrench.
a) Type: Compact, two-hole mechanical compression connectors having two clamping bolts.
(1) Connector Body: Provide a high copper bronze or brass alloy body.
(2) Bolts: Provide brass or bronze bolts; plated steel screws are unacceptable.
(3) Fasteners: Provide silicon-bronze fasteners for bolting connectors to connections.
c. Crimped Compression Connectors:
1) Provide two-hole crimped compression type connectors fabricated from high conductivity, seamless, electrolytic wrought copper, electrolytically tin-plated, and color coded to match the dies.
2) Provide crimped compression type connectors with adequate area to conduct the electrical current.
3) To crimp connectors, provide crimping tools from the same manufacturer that manufactured the connectors.
3. Control Wiring Connections:
a. For control wiring connections at terminal boards, provide crimped nylon-insulated ring terminals.
b. For control wiring splices, provide nylon insulated butt splices with insulation grips.
c. For joining more than two control wires, provide junction boxes with terminal boards.
4. Instrumentation Cable Connectors:
a. For connecting instrumentation cable and the equipment being furnished under this Contract, provide companion type connectors.
1) For equipment controllers/enclosures that are furnished under other Sections of this Contract, furnish the connectors for connecting cable to the equipment with the equipment.
2) Terminate the wiring as required for proper operation.
b. Manufacturers:
1) Thomas & Betts Corp.
2) AMP Inc.
3) Ilsco Corp.
4) Ideal Industries, Inc.
5. Connectors for Other Conductors:
a. Any of the applicable types listed for larger wire may be provided.

b. Screw Terminal Connections:
   1) For making terminal connections of stranded copper wire to screw terminals, provide nylon insulated crimped compression terminals with copper barrel on the wire.
   2) For making terminal connections of solid copper wire to screw terminals, provide screw lock connectors.

c. Wire Nuts:
   1) For making splices of copper wire, provide pre-insulated, UL-listed, solderless connectors of the spring-lock or compression type that can be installed by hand or using tools.
   2) For site lighting, wire nuts used in underground or below grade locations is prohibited. There only permitted use for site lighting is within a pole base.

d. Manufacturers:
   1) Thomas & Betts Corp.
   2) Tyco Electronics, AMP Inc.
   3) Ilsco Corp.
   4) FCI-Burndy® Products
   5) Approved equal.

2.4 SOURCE QUALITY CONTROL

A. Tests:
   1. 600 Volt Rated Multi-Conductor Cable:
      a. 70,000 BTU/hr Vertical Tray Flame Test:
         1) 600 Volt rated multi-conductor cable must pass the vertical tray flame test requirements of UL 1569, IEEE 383, and IEEE 1202.
      b. 210,000 BTU/hr Vertical Tray Flame Test:
         1) 600 Volt rated multi-conductor cable must pass the vertical tray flame test requirements of ICEA T-29-520.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Install the work of this Section only under the supervision of licensed electricians.

3.2 EXAMINATION

A. Inspect all conduits, junction boxes, electrical vaults, and handholes to verify that they are clean, that they do not have burrs, that conduits are properly aligned, and that they are complete.
   1. Ensure that on all conduits without threaded hubs, two locknuts are installed.
   2. Ensure that in all conduits with wires larger than No. 10, bushings are installed.
   3. Ensure that grounding bushings and fittings are installed at all places specified in Section 26 05 26, Grounding and Bonding.
   4. Verify that proper sized boxes are installed.

B. Verify that boxes and conduit fittings conform to the bending requirements specified in Article 314 of NFPA 70 (NEC).

3.3 PREPARATION

A. Verify that pulling calculations have been made and are available for long conduit runs and pulls as indicated in this Section.

B. Do not begin installing wiring until other work which might cause damage to the wires, cables, or conduits has been completed.
   1. Correct deficiencies in conduits, junction boxes, electrical vaults, and handholes that have been discovered by the inspection required in Paragraph3.2.A.

C. Prepare conduits to receive wire and cable.
   1. Swab the conduits with a nylon brush and steel mandrel.
   2. Pre-lubricate the conduits for which the pulling tension calculations are based on a coefficient of friction less than that of a dry conduit.

D. Verify that a means of controlling the pulling tension on the wire or cable is installed on the mechanical assist devices furnished for pulling cable.

E. Take the necessary precautions to prevent water, dirt, or other foreign material from accumulating in the conduits during the execution of wiring work.

3.4 INSTALLATION

A. Low Voltage Ground, Power, and Control Wiring:
   1. Install Type CL2P, FPLP, or CMP cable as required by the application in accordance with the requirements of NFPA 70 (NEC).
      a. For exposed low voltage wiring, use plenum cable.
      b. For low voltage wiring concealed from view, only install wiring in the accessible locations permitted by the Contract Drawings.
   2. Neutral Conductors:
      a. For each single-phase and each multi-phase feeder, provide separate neutrals.
      b. For branch circuits, except at three-phase wye-connected panelboards, provide separate neutral conductors.
         1) For the three-phase wye-connected panelboards, provide common neutrals from 3 adjacent single-pole circuit breakers or from the poles of the same multi-pole circuit breaker.
      c. Except for feeders with a small unbalanced and single-phase load, size each neutral the same as the largest phase conductor.
         1) For feeders with a small unbalanced and single-phase load, size the feeders to the largest of the following:
            a) The size of any three-phase load connected to the neutral, which contains lighting, computer power outlets, instrumentation, or other electric loads.
            b) The size required for 125 percent of the maximum unbalanced load.
   3. Equipment Ground Conductors:
      a. Provide a green equipment ground conductor with all runs.

1) Provide the equipment ground conductor wire type as specified in Section 26 05 26, Grounding and Bonding.

B. Special Cable Installation Requirements:
1. In addition to the other installation requirements specified within this Section, comply with the manufacturer's installation instructions for bending, pulling, connector types, and grounding when installing armored variable frequency drive cable.
a. Submit the manufacturer's installation instructions for armored variable frequency drive cable.

C. Pulling Cable:
1. Establish a feed-in point at the manhole, handhole, or building located at the highest elevation of the run, and pull cables down grade using flexible cable feeds to convey the cables into the duct runs through the feed-in point opening.
a. Furnish quadrant blocks located properly along the cable run.
b. Limit cable pulling tensions to the maximum pulling tensions recommended by the cable manufacturer.
1) Measure the cable pulling tension on all runs pulled with mechanical assistance and for all cable runs where calculations are required to be submitted by using a dynameter.
2) Remove cables subjected to excessive bending and tension and that are cracked or have damaged or nicked outer jackets from the Site, and replace these cables with new undamaged cables.
a) If pulling tension is exceeding during pulling, remove the affected cables and mark them as not to be reused.
c. Lubricate cables with lubricants during pulling.

D. Installing Cables in Manholes:
1. Install cable along the manhole wall that provides the longest route and the maximum spare cable length.
2. Form cables so they closely parallel the walls, and do not interfere with duct entrances.
3. Support cable on brackets and insulators spaced at a maximum of 2 feet apart.
4. Use pulling lubricants approved by the cable manufacturer.

E. Terminating Cable:
1. Terminate cable using materials and methods indicated or specified herein, or in accordance with the written instructions of the cable manufacturer or termination kit manufacturer.
a. For equipment connections, provide split bolt or compression type connectors, mechanical compression connectors, or crimped compression type connectors as specified and approved by the equipment manufacturer; for all other types of connections provide connectors of one of the types specified:
2. Protect insulated power and lighting cable terminations from accidental contact, deterioration of coverings, and moisture by using proper terminating devices and materials.

F. Splicing Wire and Cable:
1. Install all service and feeder conductors from end to end without splices.
2. Install all motor conductors from the starter to the motor without splices.
3. Only splice cables in accessible locations.
4. Below-Grade Splices:

a. In underground systems, locate splices above the 100 year flood level.
b. Make below-grade splices using a compression connector on the conductor.
c. Insulate and waterproof below-grade splices by methods suitable for continuous submersion in water using either of the methods that follow:
    1) Gravity Pour Method:
        a) Provide an approved commercial waterproof splice kit with the necessary materials and equipment, including a mold suitable for the cables to be spliced.
            (1) When the mold is in place around the joined conductors, prepare and pour the resin mix into the mold.
    2) Cast-Type Splice Insulation:
        a) Provide an approved commercial waterproof splice kit with the necessary materials and equipment, including a thermosetting epoxy resin insulating material applied by a gravity pour method or by a pressure injection method.
        b) Fix cables in place until the splicing materials have completely set.
d. Within outlet or junction boxes, make wire and cable splices that conform to the requirements of NFPA 70 (NEC).
e. Install these outlet or junction boxes in accessible locations.

G. Wiring Identification:
1. Color code all feeder wires and cables as indicated in Table **26 05 19**-1, Table 26 05 19-2 and/or Table 26 05 19-3.

Table 26 05 19-1 Feeder Wire and Cable Color Coding		
Phase	**480Y/277 Volts**	**208Y/120 Volts**
A	Brown	Black
B	Orange	Red
C	Yellow	Blue
Neutral	Gray or White with Yellow Tracer	White
Electrical Ground Conductor	Green	Green

Table 26 05 19-2 Feeder Wire and Cable Color Coding	
Phase	**120/240 Volts Single-Phase**
A	Black
B	Red
Neutral	White
Electrical Ground Conductor	Green

Table 26 05 19-3 Feeder Wire and Cable Color Coding	
Phase	**240/120 Volts Three-Phase High Leg**
A	Black
B	Red
C	Blue
Neutral	White
Electrical Ground Conductor	Green
High Leg	Add Orange tape to color indicated above

2. Identify all power wiring by circuit and panelboard, switchboard, and motor control center numbers.
3. Identify all control wiring with wire numbers.
4. Provide additional electrical identification of cabling and wiring as specified in Section 26 05 53, Electrical Identification.

3.5 FIELD QUALITY CONTROL

A. Site Tests:
1. Prior to energizing wire and cable, field test the wire and cable as specified in Section 26 05 63, Electrical Testing.

B. Inspection:
1. Record the actual installed elevations and locations of grounding cables and rods, both concealed and exposed, on the record drawings specified in Section 17 80 00, Closeout Submittals.
   a. Verify that the control wiring wire numbers correspond to the numbers indicated in the record drawings.

END OF SECTION

SECTION 26 05 26 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for connecting, energizing, testing, cleaning, and protecting grounding and bonding systems.

B. Related Sections:
   1. Section 01 33 00 – Submittal Procedures.
   2. Section 26 05 00 – Common Work Results for Electrical
   3. Section 26 05 63 – Acceptance Testing for Electrical Systems.
   4. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
   5. Section 26 05 33.13 – Conduit for Electrical Systems

1.2 REFERENCES

A. American Public Works Association (APWA):
   1. APWA Public Works Management Practices Manual.

B. American Society for Testing Materials (ASTM):
   1. ASTM B 1; Standard Specification for Hard-Drawn Copper Wire.
   2. ASTM B 3; Standard Specification for Soft-Drawn Copper Wire.
   3. ASTM B 8; Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
   4. ASTM C 653; Standard Guide for Determination of the Thermal Resistance of Low-Density Blanket-Type Mineral Fiber Insulation.
   5. ASTM D 5; Standard Test Method for Penetration of Bituminous Materials.
   6. ASTM D 149; Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
   7. ASTM D 257; Standard Test Methods for D-C Resistance or Conductance of Insulating Materials.
   8. ASTM D 570; Standard Test Method for Water Absorption of Plastics.

C. InterNational Electrical Testing Association, Inc. (NETA):
   1. ANSI/NETA ETT Standard for Certification of Electrical Testing Technicians.

D. National Fire Protection Association (NFPA):
   1. NFPA 70, National Electrical Code (NEC).

E. National Electrical Manufacturing Association (NEMA):
   1. NEMA TC-2; Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
   2. NEMA TC-3; Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
   3. NEMA TC-14; Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.

4. NEMA WC-7; Cross-Linked-Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

F. Underwriter's Laboratories, Inc. (UL):
1. UL 467, Standard for Grounding and Bonding Equipment.
2. UL 486A-486B, Wire Connectors.
3. UL 486C, Standard for Splicing Wire Connections.
4. UL 486D, Standard for Insulated Wire Connector Systems for Underground Use or in Damp or Wet Locations.
5. UL 486E, Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors.

1.3 REQUIREMENTS

A. Electrical system installation to conform to Article 300 of NFPA 70, Wiring Methods, and to other applicable articles of NFPA 70 governing methods of wiring.

B. Ground the conduit systems, metal enclosures, equipment frames, motors, and receptacles in accordance with Article 250 of NFPA 70, Grounding.
1. Ground all metallic conduits, wiring channels, and armored cables continuously from outlet to outlet, and from outlets to cabinets, junction boxes, or pull boxes.
   a. Bond each run of raceways to form a continuous path for ground faults from end to end.
   b. When liquid tight flexible metal conduit sizes larger than 1-inch or flexible metal conduit are installed, provide external bond wires.
2. Grounding Bushings:
   a. Provide all 1-inch or larger metallic conduits with grounding bushings unless they enter metallic enclosures via integral threaded hubs.
   b. Provide grounding bushings for conduits entering the bottom of freestanding equipment.
   c. Bond wire from every grounding bushing to the equipment ground stud or ground bus in the enclosure.
   d. Bond the grounding bushings to ground studs or ground buses in the enclosures.
3. Provide insulated, internal equipment ground wire in all conduits.
   a. Bond the internal wire to all pullboxes, junction boxes, equipment enclosures, and other enclosures as required by NFPA 70.

C. Equipment Grounds:
1. Design all feeders and branch circuits to include an equipment grounding conductor consisting of a copper wire within a raceway or cable and sized as specified herein.
   a. Where conductors are run in parallel in multiple raceways, run the equipment grounding conductor in parallel to the related conductors.
   b. Size each of the parallel equipment grounding conductors on the basis of the ampere rating of the circuit overcurrent protecting device.
2. Ground enclosing cases, mounting frames, rack mounted components, rack struts, switches, breakers, control panels, motors, and other electrical or electrically operated equipment by providing an equipment grounding conductor with phase conductors from an established equipment ground source.

D. Ground Wire Sizes:

1. The minimum size for bonding jumpers, equipment ground conductors, grounding electrode conductors, and ground grid conductors is as follows:
   a. Under 600 volts:
      1) Provide #12 AWG, minimum.
      2) Control power circuits, Provide #14 AWG, minimum.
2. When the ground wire size is not specified or indicated on the Contract Drawings, provide wire sized in accordance with the requirements of NFPA 70.

E. Within 60 days of the Contract award, submit the following:
1. The Submittals required by Section 26 05 00.
   a. Include Product Data and Catalog Cuts for all products provided, and describe the usage of each product.
2. Shop Drawings for the ground well grid installation in unpaved areas.
3. Shop Drawings for the ground well grid installation in paved areas.
4. Shop Drawings for the ground bus installation.

F. Project Record Documents:
1. Prepare and submit record drawings showing the actual installed elevations and locations of grounding cables and rods for both concealed and exposed work provided under this Contract.

G. Project Closeout:
1. Submit Operation and Maintenance Manuals that include the record drawings and all Product Data in accordance with Metro North standards.

1.4 SUBMITTALS

A. Submit the following information for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
1. Product Data:
   a. Manufacturer's product data
2. Shop Drawings:
   a. Ground well grid installation in unpaved areas.
   b. Ground well grid installation in paved areas.
   c. Ground bus installation.
3. Quality Control Submittals:
   a. Certificates:
      1) Testing agency product certification
   b. Qualification Statements:
      1) System installers' qualifications
      2) Installation supervisors' resumes
4. Closeout Submittals:
   a. Operation and Maintenance Manuals

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Installer Qualifications:

a. Employ installers who specialize in the work of this Section, and who can demonstrate a minimum of three years documented experience.
b. Submit the system installers' qualifications.

2. Supervisor's Qualifications:
a. Employ supervisor to supervise the installation work who are skilled licensed electricians.
b. Submit the installation supervisors' resumes.

3. All products are to be certified by Underwriters Laboratories, Inc. (UL),

B. Regulatory Requirements:
1. All grounding and bonding Work must comply with the requirements of NFPA 70, the National Electrical Code.

C. Certifications:
1. Testing Agency Product Certification:
a. Verify product quality by certifying products as meeting the requirements of one of the following:
1) Underwriters Laboratories, Inc. (UL).
a) Provide products listed and labeled by UL.
b. Testing agency product certification must include agency listing and labeling, either by a printed mark on the data or by a separate listing card.
1) If an item does not have this quality assurance verification, provide a written statement from the product manufacturer indicating why not; such manufacturer's statements are subject to the approval of Metro North Railroad.

1.6 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
1. Transport materials, both on site and from Contractor's storage to site, in accordance with the recommendations of the respective manufacturers.

B. Storage and Protection:
1. Store materials, both on and off site, in accordance with manufacturer's written instructions.
2. Store products indoors on blocking or pallets.

PART 2 - PRODUCTS

2.1 UNDERGROUND WARNING TAPE

A. Metal detectable polyester material, with minimum one-inch high lettering. Overcoated graphics to read, "CAUTION-BURIED ELECTRIC LINE BELOW" for electric lines and/or "CAUTION – TELECOMMUNICATION BELOW" for telephone lines. APWA color to be red for electric lines and orange for telecommunication or fiber-optic lines.

B. Acceptable Manufacturers:
1. Brady #91600 Series
2. Presco

3. Seton
4. Or Approved Equal

2.2 MATERIALS

A. Conduit and Conduit Fittings:
1. For conduit and conduit fittings that enclose single ground wires without accompanying circuit conductors provide one of the following:
   a. Schedule 80, non-metallic conduit and fittings conforming to the requirements of Section 26 05 33.13 and the conduit additionally conforming to the requirements of NEMA TC-2, and the fittings additionally conforming to the requirements of NEMA TC-3.
   b. Fiberglass reinforced plastic (FRP) conduit and fittings conforming to the requirements of NEMA TC-14 and Section 26 05 33.13.
2. For other conduit and conduit fittings, provide conduit of the types specified or indicated and that conform to the requirements of Section 26 05 33.13.

B. Wire:
1. Bare Ground Wire:
   a. Soft drawn copper, Class A or Class B stranded, meeting the requirements of ASTM B3 for sizes #6 or larger.
   b. Soft drawn solid copper, meeting the requirements of ASTM B3 for sizes #8 or smaller.
2. Insulated Ground Wire:
   a. Provide insulated Class B copper stranded wire rated for 600 volts that conforms to the requirements of NEMA WC-7, and is green in color. Insulation type shall be as specified in Section 26 05 19.
3. Acceptable Manufacturers:
   a. Continental Wire & Cable Company www.continentalwire.com
   b. SouthWire www.southwire.com
   c. General Cable www.generalcable.com
   d. Okonite Co. www.okonite.com
   e. Or Approved Equal

C. Clamps and Non-Welded Connectors:
1. Provide bronze or brass clamps and connectors that are UL listed for use below grade.
   a. All bolts and other material must be bronze or brass, plated steel screws are unacceptable.
   b. Fabricate multi-bolt, solderless compression clamps from high strength electrical bronze, and provide silicon bronze clamping bolts and hardware.
2. Provide bolts, nuts, lock-washers, and similar hardware designed not to damage ground wire.
3. Acceptable manufacturers:
   a. Ilsco.
   b. Framatone Connectors Inc. (FCI), Burndy.
   c. Or Approved Equal.

D. Exothermic Welding Kits:

1. Provide molds, thermite packages, and other material for exothermic welds that are rated to carry 100 percent of the cable ratings, and which are letter-coded exothermic welded type.
2. Provide all items such as tees, crosses, splices, and cable connections necessary for connecting ground and bonding cables to the following items:
   a. Ground rods.
   b. Reinforcing steel bars.
   c. Ground-bus.
   d. Structural steel.
   e. Water pipe.
   f. Bonding to the main-ground-grid.
   g. Bonding to Copper Grounding Bus Bar
3. Provide all exothermic welding molds, thermite packages, and other material used throughout the Work from a single manufacturer.
4. Acceptable Manufacturers:
   a. Erico, Cadweld®.
   b. Continental Industries, Inc., Thermoweld®.
   c. Or Approved Equal.

E. Ground Rods:
1. Provide UL listed, sectional ground rods fabricated using an electrolytic plating process to copper clad a medium carbon steel core
2. Diameter: 3/4 inch.
3. Length: 10 feet.
   a. To obtain longer length rods, join rod sections using copper clad rod couplers.
4. Acceptable Manufacturers:
   a. Erico International Corp.
   b. Galvan Industries, Inc.
   c. South Atlantic, LLC
   d. A.B. Chance Co.
   e. Or Approved Equal

F. Concrete Protective Boxes (Ground Wells):
1. Provide precast concrete boxes with flush cast iron covers rated for heavy traffic H20 areas and having slots for conduit entrances.
   a. Minimum size: 10” diameter by 12” high with maximum depth up to 36”.
   b. Cover legend: Provide the cast-in legend “GROUND TEST WELL” in the cast iron covers provided.
2. Acceptable Manufacturers:
   a. National Lightning Protection Corporation
   b. East Coast Lightning Equipment
   c. Or Approved Equal

G. Coating Compound:
1. Provide permanently pliable, moldable, un-backed, black rubber based coating materials for covering or coating grounding clamps and connectors.
2. Coating Physical Properties:
   a. Solids/Density: 100 percent; 12 pounds per gallon.
   b. Penetration: Within 90 to130 when tested in accordance with ASTM D 5.
   c. Water Absorption: 0.10 percent, maximum, when tested in accordance with ASTM D 570.

d. Dielectric Strength: 500 volts/mil when tested in accordance with ASTM D 149.
e. Volume Resistivity: 2,000 megohm-inches, or 5,000 megohms-cm, when tested in accordance with ASTM D 257.
f. Service Temperature: Minus 40 degrees to 160 degrees Fahrenheit; and having no melting point; flammability, or slow burning when tested in accordance with ASTM C 653.
g. Chemical Resistance:
    1) Resistant to alcohol, water, aqueous hydrochloride, and sodium hydroxide.
    2) Dissolved by carbon tetrachloride, naphtha gasoline, mineral spirits, and benzene.
h. Cohesive/Adhesive: Adheres to metals, concrete, and itself.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions:
    1. The Contract Drawings are generally indicative of the Work, but due to their small scale, it is not possible to indicate some offsets and fittings required nor the minor structural obstructions that may be encountered.
        a. Perform field measurements to discover offsets and fitting requirements not shown.
        b. Locate all on-site utilities and other obstructions in the area of construction, and verify that interferences will not occur.

3.2 PREPARATION

A. Layout electrical work to suit actual field conditions and in accordance with accepted standard practice.

3.3 INSTALLATION

A. Perform required earthwork including excavation, backfill, and compaction, as specified.

B. Construct each ground system and connection so it is mechanically secure and electrically continuous.
    1. Secure grounds to boxes in such a manner that each system is electrically continuous from the point of service to each outlet.
    2. Terminate conduits using double locknuts and bushings.
        a. Unless a conduit run enters a metallic enclosure via integral threaded hubs, provide the conduit run with two locknuts.
    3. Clean paint, grease and such other insulating materials from the contact points of grounds.

C. Ground Grids:
    1. Installing Ground Rods:

a. Drive ground rods head to 6 inches below grade by using a ground rod cap to protect the head of the rod.
    1) If the top of the rod is damaged during driving operations, cut it off.

2. Installing Ground Wells:
    a. Install a concrete protective box for the ground well flush with the grade and 4 inches above the top of the ground rod designated on the Contract Drawings.

3. Installing Ground Wires:
    a. Excavate the trenches for the ground grid cables, and lay the ground cable in the trenches from ground rod to ground rod without splice, and from one side of the grid to the other as shown on the Contract Drawings.
        1) Lay the ground grid cables cable allowing 10 percent slack.
        2) Form 12-inch minimum radius bends at changes in direction.
        3) At intersections, place cables so they diverge 60 degrees or more from other cables at the intersection.
        4) Connect service entrance grounds directly to the ground grids without splices in the cable.
    b. Route connecting cables from the ground grid in the trenches to the building structure.
        1) Route exposed cables parallel to the building lines, except for bends; form all bends with a 12-inch minimum radius.
        2) Wherever the cable breaks grade, provide schedule 80 conduit from 2- feet below finished grade to 3-feet above finished grade for protection; and provide conduit at other points where the cable may be subject to damage.
    c. Clamp the conduit to the building structure's wall at the ends and at intervals not to exceed 5 feet.
        1) Whenever cable exits from the conduit, clamp the cable to the wall at intervals not to exceed 5 feet and at each entrance to equipment.
        2) Allow a 1/4 inch space between ground cables, conduit, and the surface it is mounted on.
    d. Remove any damaged or kinked cable.

4. Welding ground wires to the ground rods and equipment connections.
    a. Follow the procedures of the exothermic welding kits manufacturer.
    b. Prior to welding ground wires to the ground rods and equipment connections perform the following:
        1) Clean the proposed welding area of combustible and flammable materials; and block access to personnel to protect them from harm; and provide a shield to prevent damage to other materials.
        2) Clean insulation from ground wire for a distance of 12 inches, and clean the exposed wire to a bright finish.
        3) Clean paint, grease, and other similar insulating materials from contact points.
        4) Inspect the molds for damage; and discard any faulty mold or any molds used over 40 times.
    c. Exothermically weld the ground wires to the ground rods as shown on the Contract Drawings, including to ground rods at grid crossings, to ground rods at grid intersections on the sides of the ground grid, and at all equipment connections.
    d. After completing the welding, replace the insulation removed from insulated wires, and coat connections and the area around connections with coating compound.
        1) Coating Thickness: 1/8-inch, minimum.
        2) Make sure the coating is free from pin-holes and holidays.

5. Make all connections to electrical equipment and ground buses with compression, two-hole lugs and studs.
    a. Clean paint, grease, and other similar insulating materials from the contact points for the ground lugs and studs.
    b. Clean all wires to a bright finish prior to construction the connections.

D. Equipment Ground Buses:
1. Whenever several pieces of equipment, other than service grounds, require external bond wires in an area, provide an equipment ground bus.
2. Wherever 5 or more conduits enter a box or enclosure, provide an equipment ground bus.
    a. Connect all equipment ground wires and conduit bond wires within the box or enclosure to a single ground stud or single common ground bus.
3. Size ground buses to carry 100 percent of the rating or setting of the largest over current device in the circuit(s) ahead of the equipment, conduit, or other item, and as indicated on the Contract Drawings.

E. Equipment Grounds:
1. Install equipment grounds in spaces accessible to authorized personnel only.
2. Equipment Grounding Connectors:
    a. Only use approved grounding connectors.
        1) Terminate grounds with closed lugs with star washers on both sides and a 1/4-20 bolt and nut, minimum; spade lugs are not allowed.
        2) For portable electrical equipment, provide electric cords having an equipment grounding conductor and a NEMA and UL approved cord cap.
    b. Do not install grounding lugs on flanges, mounting screws, or standoffs in switches, distribution boxes, or panels.
    c. Cover or coat grounding clamps and connectors with coating compound.
3. Equipment Grounding Conductors:
    a. Unless using multi-conductor cable, run equipment grounding conductors inside the same conduit or wiring channel enclosing the power conductors.
    b. In multi-conductor cable, locate grounding conductor inside the sheath or cable.
    c. Do not use a system neutral or a current carrying conductor as the equipment grounding conductor.
        1) Do not ground the electrical and electronic equipment neutral to chassis, racks, equipment ground conductor, or any non-current carrying conductor on the equipment.
4. Grounding Lighting Fixtures:
    a. Provide the housing of each lighting fixture with a separate, factory-installed grounding device and ground conductor.
    b. Use the factory-installed grounding device for connecting a separate grounding conductor meeting applicable grounding requirements of the NEC to the fixture.
        1) Provide a green covered grounding conductor of the same wire gauge as the two power feed wires.
        2) Provide a continuous ground for the fixture construction.
5. Grounding Motors:
    a. Install equipment grounding wire within conduit supplying power to motor.
    b. Install bonding connectors across the liquid tight flexible conduit supplying motors.
6. Grounding and Bonding Pumps:
    a. Provide a bond from each pump to its motor using a conductor equal in size to the motor circuit equipment grounding conductors.

7. Grounding Transformers:
   a. If a transformer is a separately derived system as defined in NFPA 70, provide a ground wire in both the primary and secondary conduits; and bond the ground wire and metallic conduits, if used, to the nearest effectively grounded metallic water pipe or nearest effectively grounded structural steel column.
   b. Provide an additional bond between cold or hot water pipes and structural steel located near a transformer bond connection.
8. Grounding Isolated Ground Receptacles:
   a. Ground the receptacle grounding terminal via an insulated equipment grounding conductor routed with the circuit conductors within the raceway.
      1) This grounding conductor may pass through one or more panelboards without being connected to the panelboard grounding terminal in order to terminate directly at an equipment grounding conductor terminal of the applicable separately derived system or service within the same building or structure.
   b. Use of isolated equipment grounding conductors does not remove the requirement for grounding the raceway system and outlet box.
9. Fences:
   a. Fences shall be bonded to dedicated ground rods in at least two locations in and at a maximum interval of 200 feet around fences longer than 400feet. Ground rods shall be equally spaced around the perimeter of the fence.
   b. Fences shall be bonded to dedicated ground rods at each side of a gate or other opening.
      1) A buried bonding jumper shall be used to bond across a gate or other opening.
   c. Gates and any barbed wire strands shall be bonded to the grounding conductor, jumper or fence.
   d. When fence posts are of conducting material, a grounding conductor shall be bonded to the fence post as required with a suitable connecting means. For non-conducting posts, suitable bonding connection shall be made to the fence mesh and barbed wire strands at each grounding conductor point.
   e. For fences located within 5 feet of electrical equipment (transformers, switchgear, etc.), each fence ground rods shall be bonded to the equipment ground bus.
   f. For outdoor substations where a station ground ring and/or mat is installed, each fence ground rod shall be bonded to the station ring and/or mat.
   g. Where an overhead power line crosses a fence, the fence shall be bonded to at least one additional dedicated ground rod installed directly under the line. This ground rod shall be bonded to the nearest pole ground.
   h. Bonding conductors shall be minimum 6 AWG copper unless otherwise indicated on the plans.
   i. Ground rods, bonding jumpers, and connections shall comply with Section 26 05 26.

3.4 REPAIR/RESTORATION

A. Replace any finished exothermic welded splice connections that inspections find to be defective.

B. After inspection by Metro North Railroad's representative, backfill the direct buried cables and around ground rod protectors.

1. Begin backfilling with clean washed sand to 6 inches above the ground rods or to the depth shown on the Contract Drawings, whichever is greater.
2. Backfill using select fill in accordance with the requirements of Section 02315.
3. Slope the finish grade away from ground rods at a slope of 1 inch in 18 inches for a distance of 27 inches from the rods in all directions.

C. Install underground warning tape above all buried cables/conduits at a depth of 12" below finished grade.

3.5 FIELD QUALITY CONTROL

A. Site Testing:
1. Prior to energizing any system, test the resistance to ground for the system in accordance with Section 26 05 63.
    a. Perform a continuity test from all utilization and distribution equipment to the ground grid on a run-by-run basis.

B. Inspection:
1. Prior to completion of the Work of this Section, inspect the items provided for conformity to the Contract Drawings and Specifications.
    a. Leave in-place "made grounds" open until they have been inspected and approved by Metro North Railroad.
    b. Clean the surfaces involved in "made grounds" before connecting the grounds, and finish the installation with touch up painting or another protective coating to prevent corrosion.
2. Inspect finished exothermic welded connections for the following defects:
    a. Conductors appear within the splice area.
    b. Top of splice risers are below conductors.
    c. Surfaces exhibiting more than 20 percent slag material.
    d. Surfaces with over slag material that has flowed into conductors.
    e. Mold blowouts.
    f. Excessive porosity.
        1) Small pores less than 1/32 inch are permitted.

3.6 PROTECTION

A. Protect finished insulated wires from being painted.

B. Protect all ground grid wells from damage during paving and landscaping.

C. Protect all ground grid installations and ground wires from damage during the work of other Sections.

END OF SECTION

SECTION 26 05 28 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, cleaning, and protecting hanger and support systems for electrical wiring, conduit boxes, and equipment.

B. Related Section:
   1. Section 01 33 00 - Submittal Procedures.
   2. Section 26 05 00 – Common Work Results for Electrical

1.2 REFERENCES

A. American Iron and Steel Institute (AISI):
   1. AISI Standard Steels (Handbook).

B. American Society for Testing Materials (ASTM):
   1. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.
   2. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot- Dipped, Zinc-Coated - Welded and Seamless.
   3. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   4. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   5. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
   6. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi, Minimum Tensile Strength.
   7. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   8. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts.
   9. ASTM A 575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
   10. ASTM A 576 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
   11. ASTM A 635/A 635M - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot-Rolled.
   12. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot- Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   13. ASTM B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
   14. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

C. American Welding Society (AWS):
   1. AWS D1.1/D1.1M - Structural Welding Code - Steel.

D. National Electrical Manufacturers Association (NEMA):
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts maximum).

E. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code (NEC).
   2. NFPA 258 - Standard Research Test Method for Determining Smoke Generation of Solid Materials.

F. Society of Automotive Engineers International (SAE):
   1. SAE J 429 - Mechanical and Material Requirements for Externally Threaded Fasteners.

G. The Society for Protective Coatings (SSPC):
   1. SSPC Painting Manual.
      a. SSPC-SP 2 - Hand Tool Cleaning.
      b. SSPC-Paint 15 - Paint Specification No. 15, Steel Joist Shop Paint, Type I, Red Oxide Paint, Type II, Asphalt Coating.
      c. SSPC-Paint 20 - Paint Specification No. 20, Zinc-Rich Primers (Type I, "Inorganic," and type II, "Organic").

H. Underwriters Laboratory, Inc. (UL):
   1. UL 568 - Nonmetallic Cable Tray Systems.
   2. UL 635 - Standard for Insulating Bushings.
   3. UL 870 - Standard for Wireways, Auxilliary Gutters, and Associated Fittings.
   4. UL 884 - Standard for Underfloor Raceways and Fittings.
   5. UL 1479 - Standard for Fire Tests of Through-Penetration Firestops.
   6. UL 2239 - Hardware for the Support of Conduit, Tubing, and Cable.

I. U. S. General Services Administration (GSA)
   1. Federal Specifications:
      a. A-A-1922A - Shield, Expansion (Caulking Anchors, Single Lead).
      b. FF-S-107C(2) - Screws, Tapping and Drive.

1.3 SUBMITTALS

A. Submit the following information to the Engineer for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures, and Section 26 05 00, Basic Electrical Materials and Methods:
   1. Product Data:
      a. Provide product data and catalog cuts for the products provided under this Section.
   2. Shop Drawings:
      a. Provide Shop Drawings.
      b. Provide Shop Drawings of hanging supports for conduit.
   3. Quality Assurance/Control Submittals:
      a. Design Data:
         1) Provide structural calculations for the following items:
            a) Equipment backboards and support structures not directly fastened to the walls.

b) Hanging supports for conduit.

2) Detailed drawings of proposed departures from the original design.

b. Certificates:

1) Testing Agency/Quality Verification:

a) With the product data for electrical hangers and supports, provide evidence of quality verification, listing, and labeling by the Electrical Testing Agency (ETA); either by a printed mark on the data, or by a separate listing card.

b) If an item does not have ETA quality assurance verification, provide a written quality assurance verification statement from the product manufacturer indicating why the item does not have the specified quality assurance verification.

(1) Such quality assurance verification statements are subject to approval by Metro North Railroad.

2) Manufacturers' Certificate of Compliance.

c. Qualification Statements:

1) Manufacturers' qualifications.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Electrical Testing Agency (ETA) Qualifications:
   a. Use the Electrical Testing Agency (ETA) qualified as specified in Section 26 05 00, Basic Electrical Materials and Methods.
2. Manufacturer's Qualifications:
   a. Provide electrical support framing made by manufacturers that have been manufacturing support framing for a minimum of 5 years, and who carefully controls their operations to ensure that excellent product engineering, quality, safety, and reliability are achieved.
   b. Submit the manufacturer's qualifications to Metro North Railroad for approval.

B. Certifications:

1. Electrical Testing Laboratory (ETL) Certification:
   a. Provide products that are listed and labeled by Underwriters Laboratory, Inc. (UL) or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) unless products meeting the requirements of these testing laboratories are not readily available or unless standards do not exist for the products.
2. Manufacturers Certificate of Compliance:
   a. Submit a manufacturer's Certificate of Compliance certifying that both the galvanizing and the products meet the requirements of the ASTM standards.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packaging, Shipping, Handling, and Unloading:

1. Deliver, store, and handle the hangers and supports in accordance with Section 26 05 00, Basic Electrical Materials and Methods, and as specified herein.
2. Deliver material to Site in the original factory packaging.

B. Storage and Protection:

1. Shelter and store the components under cover, and supported off the ground and floors on blocking.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Carbon Steel Shapes:
   1. Provide shapes of the sizes specified and as indicated on the Contract Drawings:
   2. Provide steel shapes complying with the following material specifications for the type of steel shape listed:
      a. Steel Sections: ASTM A36/A 36M.
      b. Steel Tubing: ASTM A 500, Grade B.
      c. Plates: ASTM A 283/A 283M.
      d. Sheets: ASTM A 1011/A 1011M.
      e. Pipe: ASTM A 53/A 53M, Grade B, Schedule 40, hot-dipped, zinc-coated.

B. Welding materials:
   1. Provide welding materials complying with the requirements of AWS D1.1/D1.1M for the type of material being welded.

2.2 MANUFACTURED UNITS

A. Metal U-Channel Electrical Support Framing Systems and Fittings:
   1. Carbon Steel U-Channel Support Framing Systems:
      a. Provide 1-5/8-inch nominal size U-channel supports fabricated from 12 gauge carbon steel electrolytically galvanized with a zinc-coating thickness commensurate with Service Condition SC 1 (mild) in conformance with the requirements of ASTM B 633.
         1) For Type II ASTM B 633 galvanized finishes, fabricate the framing from steel complying with the requirements for Grade 33 specified in
         2) ASTM A 1011/A 1011M.
         3) For Type III ASTM B 633 galvanized finishes, fabricate the framing from steel complying with the requirements of ASTM A 575, ASTM A 576, ASTM A 635/A 635M, or ASTM A 36/A 36M.
      b. Where combination members are required, spot-weld the members on 3- inch centers.
      c. Provide 1-3/8-inch or larger depths, except where supports are mounted directly to walls 13/16-inch or larger depths may be provided.
      d. Provide metal framing systems and fittings for metal framing systems from a single manufacturer.
      e. Manufacturers:
         1) Unistrut Corporation, Unistrut® Metal Framing System, www.unistrut.com.
         2) Thomas & Betts, Kindorf®, http://elec-cat.tnb.com.
         3) Cooper B-Line®, Inc., www.b-line.com.
   2. Stainless Steel U-Channel Support Framing Systems:
      a. Provide U-channel supports, fittings, threaded rod, and hardware fabricated from Type 316 stainless steel.

3. PVC-Coated Steel U-Channel Support Framing Systems:
   a. Provide U-channel supports, fittings, threaded rod, and hardware fabricated from PVC-coated carbon steel.

B. Nonmetallic Electrical Support Framing Systems and Fittings:
   1. Fiberglass Reinforced Polyester Angles, Channels, and Bars:
      a. Provide non-metallic angles, channels, and bars fabricated from a high impact strength, fiberglass reinforced polyester formulation having a glass to resin ratio of 45 to 55 percent by weight.
      b. Provide angles, channels, and bars that meet or exceed a Class 1 flame spread rating of less than 25 determined according to the requirements of ASTM E 84, and a smoke rating of 5 determined according to the requirements of the Smoke Chamber Test specified in NFPA 258.
      c. Manufacturers:
         1) Enduro Systems, Inc., www.endurocomposites.com.
         2) Robroy Industries, www.robroy.com.
         3) Or Approved Equal.
   2. Pre-Engineered Glass-Fiber-Reinforced Supporting Systems:
      a. Pre-engineered, UL-listed supporting systems fabricated from glass-fiber-reinforced composites may be used in lieu of field-fabricated support systems.
      b. Manufacturers:
         1) Unistrut, www.unistrut.com.
         2) Allied Electrical Group, Aickinstrut Fiberglass Framing System, www.alliedtube.com.
         3) Enduro Systems, Inc., www.endurocomposites.com.

C. Conduit Supports:
   1. Malleable Iron Conduit Supports:
      a. Provide one-hole style galvanized malleable iron fasteners with pipe straps similar to those as manufactured by Thomas & Betts.
      b. Provide support devices consisting of threaded rods, channel supports, and conduit straps/fasteners.
   2. Stamped Steel Conduit Supports:
      a. Provide one-hole style galvanized stamped steel fasteners with pipe straps similar to those as manufactured by Thomas & Betts.
      b. Provide support devices consisting of threaded rods, channel supports, and conduit straps/fasteners.
   3. Special Finishes:
      a. Where PVC-coated RGS conduits are to be installed, provide 40-mil PVC coated conduit supports including the threaded rods, channel supports, and conduit straps/fasteners.
   4. Manufacturers:
      a. Thomas & Betts, http://www-public.tnb.com/Design Builder/docs/superstrut.pdf.
      b. Or Approved Equal.

D. Cable Supports:
   1. Provide voltage rated cable supports fabricated from hot-dip galvanized malleable iron with a threaded collar.
   2. Provide tapered wedging cable plugs fabricated from hard fiber, impregnated hardwood, or canvas bakelite for the cable supports.
   3. Manufacturers:

a. EGS Electrical Group, O-Z/Gedney, Inc., Type "M", http://www.o-zgedney.com/PDF/QA%201thru16.pdf.
b. Or Approved Equal.

E. Bolts, Nuts, and Washers:
1. For bolts, nuts, and washers smaller than 1/4-inch trade size, provide 316 stainless steel fasteners complying with the requirements of ASTM A 325.
2. For fastening galvanized components, provide galvanized bolts, nuts, and washers galvanized in accordance with the requirements of ASTM A 325.

F. Anchors and Fasteners:
1. Drive (Deep-Pitch) Screws:
a. Provide Type 316 stainless steel self-tapping type drive (deep-pitch) screws that comply with the requirements of FF-S-107C(2).
2. Drilled-In Anchors and Fasteners:
a. Provide drilled-in anchors and fasteners that comply with the requirements of FF-S-107C(2).
b. Masonry Anchors:
1) Provide masonry anchors designed to accept both machine bolts and threaded rods as fasteners.
a) Provide SAE J 429 Grade 2 machine bolt fasteners fabricated from AISI Type 316 stainless steel.
b) Provide nuts and washers conforming to the requirements of ASTM A 563.
2) Provide masonry anchors consisting of an expansion shield and expander nut contained inside the shield.
a) Expander Nuts:
(1) Fabricate square expander nuts with their sides tapered inward from the bottom to the top.
(2) Design the expander nuts to simultaneously climb the bolt or rod thread and expand the shield as soon as the threaded expander nut reaches and bears against the shield bottom when being tightened.
b) Expansion Shields:
(1) Provide expansion shield bodies consisting of four legs, the inside of each tapered toward the shield bottom, or nut end.
(2) The end of one leg shall be elongated and turned across shield bottom. Outer surface of shield body shall be ribbed for grip-action.
3) Masonry Anchor Material:
a) Provide die cast Zamac No. 3 zinc alloy having a 43,000 psi minimum tensile strength.
4) Manufacturers:
a) U.S.E. Diamond, Inc., FORWAY System, www.mktfastening.com.
c. Concrete Anchors:
1) Carbon Steel Anchor/Fastener:
a) Provide UL listed one-piece studs (bolts) with integral expansion wedges, nuts, and washers.
b) Provide carbon steel anchor/fasteners complying with the physical requirements specified in FF-S-325 for Group II, Type 4, Class 1.
2) Stainless Steel Anchor/Fastener:

a) Provide one-piece AISI Type 303 or 304 stainless steel studs (bolts) with integral expansion wedges, AISI Type 316 stainless steel nuts, and AISI Type 316 stainless steel washers.
b) Provide stainless steel anchor/fasteners complying with the physical requirements of FF-S-325 for Group II, Type 4, Class 1.

3) Acceptable Manufacturers:
a) U.S.E. Diamond, Inc.; SUP-R-STUD, www.mktfastening.com.
b) Hilti Fastening Systems; KWIK-BOLT, hilti.com.
c) Molly Fastener Group; PARABOLT.
d) Phillips; RED HEAD Wedge-Anchor, www.phillipsfastener.com.

3. Hammer drive-type explosive charge drive-type anchors and fastener systems are unacceptable.
4. Lead shields, plastic-inserts, fiber-inserts, and drilled-in plastic sleeve/nail drive systems are unacceptable.

2.3 ACCESSORIES

A. Wall Seals:
1. Provide a hydrostatic seal to fill the annular space between conduit and through structure openings.
2. Manufacturer:
a. PSI-ThunderLine/Link-Seal Corp., Link-Seal®, www.linkseal.com.

B. Fire Seals:
1. Where conduit penetrates fire-rated walls, floors, partitions, and ceiling, provide approved fire seals to ensure that the fire rating is maintained.
2. Provide a fire seal system which is UL-listed for the application.
a. Provide fire seal compound or a mechanical seal for fire rating of 2 hours or less.
3. Manufacturers:
a. Compound Fire Seals:
1) Dow Corning Corporation, www.dowcorning.com.
2) 3M, http://solutions.3m.com/en_US/.
b. Mechanical Fire Seals:
1) PSI-ThunderLine/Link-Seal Corp., www.linkseal.com.
c. Through-Wall Barrier Fire Seals:
1) Cooper Crouse-Hinds, http://crouse-hinds.com.

2.4 FABRICATION

A. Fit and shop assemble items in the largest sections practical for delivery to the Site.

2.5 FINISHES

A. Prime paint non-galvanized steel items.
1. Prepare surfaces to be primed in accordance with the requirements of SSPC-SP 2.
a. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
2. Prime Painting: Apply one coat of primer.

B. Galvanizing items specified above as galvanized.
   1. Galvanize the items after fabrication in accordance with the requirements of ASTM A 123/A 123M.
   2. Provide a minimum galvanized coating of 1.25 ounces per square foot (380 grams per square meter).

C. Touch-Up Primer:
   1. For un-galvanized metal surfaces: Provide primer complying with the requirements of SSPC-Paint 15 for Type I, Red Iron Oxide.
   2. For galvanized surfaces: Provide primer complying with the requirements of SSPC-Paint 20 for Type I, Inorganic Zinc-Rich Primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Field Measurement:
   1. Although the Contract Drawings are generally indicative of the Work, take field measurements to verify actual conditions.
      a. Due to the small scale of the Contract Drawings it is not possible to indicate all offsets, fittings, and apparatus required or the minor structural obstructions that may be encountered during the Work.
   2. Carefully investigate the structural and finish conditions, and other construction work, at the Site which may affect the work of this Section.

3.2 PREPARATION

A. After carefully investigating structural and finish conditions and other in-place construction work, produce detailed Shop Drawings showing proposed departures from the original design due to field conditions or other causes.
   1. Layout the electrical work according to accepted standard electrical trade practice to suit actual field measurements.
   2. Arrange the electrical work to consider existing conditions and to preserve access to other equipment, rooms, areas, and similar features of the construction.
   3. Provide plan and profile views of duct banks, and show equipment backboards and support structures not directly fastened to the walls on the Shop Drawings.
   4. Indicate the location and details of conflicting utility construction and slopes on the Shop Drawings.
   5. Submit the Shop Drawings to Metro North Railroad for approval prior to performing the Work of this Section.

B. Obtain roughing-in dimensions of electrically operated equipment, including equipment being installed by both electrical and other construction trades.
   1. Set conduit and boxes only after receiving approved dimensions and checking such equipment locations.
   2. Arrange electrical Work accordingly and furnish such fittings and apparatus as required to accommodate such conditions and to preserve access to other equipment, rooms, areas, and similar spaces.

3.3 INSTALLATION

A. Install electrical Work in conformance to the requirements of NFPA 70 for wiring methods general requirements, and to other applicable Articles of the NEC governing methods of wiring.

B. Installing Anchors and Fasteners:
   1. For anchoring or fastening applications in masonry and hollow-core precast concrete structural elements, provide masonry anchors as specified herein.
   2. For anchoring or fastening applications in cast-in-place concrete and solid precast concrete structural elements, provide concrete anchors as specified herein.
   3. Threaded Bolts:
      a. Draw threaded bolted connections up tight using 316 stainless steel lock washers to prevent the bolt or nut from loosening.
   4. Drilled-In Expansion Anchors:
      a. Install expansion anchors in strict accordance with manufacturer's instructions and the following.
         1) Drill holes to the required diameter and depth in accordance with anchor manufacturer's instructions for the size of anchor being installed.
         2) Minimum Embedment:
            a) Embed expansion anchors to four and one-half bolt diameters minimum unless otherwise indicated on the Contract Drawings.

C. Installation of U-Channel Support Framing Systems in accordance with Table 26 05 28-1 below:

Table 26 05 28-1 U-Channel Support Framing Selection

Condition 1	Condition 2	Type
Aboveground	Outside vertical support within 6” of concrete	PVC Coated Steel or Stainless Steel
	Outside other locations	Stainless Steel or PVC Coated Steel
	Interior NEMA 1/12	Carbon steel, Stainless Steel, PVC Coated Steel or Glass-Fiber-Reinforced
	Interior NEMA 4X	Stainless Steel, PVC Coated Steel or Glass-Fiber-Reinforced

D. Installing Conduit Supports:
   1. For exterior locations provide PVC coated rigid galvanized conduit supports.
   2. For interior locations, provide galvanized steel conduit supports.

E. Panelboard/Enclosure Feed Risers:
   1. Furnish and install cable supports in feeder risers as required by the underwriters.

F. In areas designated as wet, NEMA 3, NEMA 3R, NEMA 4X, NEMA 12, or NEMA 13 as defined in NEMA 250; secure equipment and conduit to no fewer than two 7/8-inch minimum depth, non-metallic channels mounted vertically on the walls.

G. Field Fabrication:
1. Fabricated Items:
a. Fabricate backboards, backboard supports, equipment supports, conduit supports, and the other items as detailed on the Contract Drawings.
1) Hot-dip galvanize mild-steel fabrications in accordance with the requirements of ASTM A 153/A 153M.
b. Fabricate backboard posts as detailed on the Contract Drawings from concrete filled steel pipe with a crowned cap; and apply a prime paint finish.
c. Supply components required for the anchorage of fabrications.
1) Except where specifically noted otherwise, fabricate anchors and related components from the same material as the fabrication and apply the same finish.
2. Tightly fit and secure joints.
a. Make exposed joints butt tight, flush, and hairline.
b. Weld fabricated assemblies in accordance with AWS D1.1/D1.1M.
1) Continuously seal joined members using intermittent welds and plastic filler.
2) Dress welds smooth and free of sharp edges and corners.
c. Grind exposed joints flush and smooth with the adjacent finish surface.
3. Ease exposed edges to a small uniform radius.
a. Cut all backboard corners to a 1-inch radius.
4. For the attachment of work and for bolted connections, accurately drill or punch holes for the fasteners as required.
a. Burned holes are unacceptable.
b. Provide holes no more than 3/32-inch larger than the fasteners.
5. Exposed Mechanical Fastenings:
a. Except where specifically noted otherwise in the Contract Documents, provide flush countersunk screws or bolts; unobtrusively located, and consistent with the design of the component.
6. Fabrication Tolerances:
a. Squareness: 1/8 inch (3 mm), maximum difference in diagonal measurements.
b. Maximum offset between faces: 1/16 inch (1.5 mm).
c. Maximum misalignment of adjacent members: 1/16 inch (1.5 mm).
d. Maximum bow: 1/8 inch (3 mm) in 48 inches (1.2 m).
e. Maximum deviation from plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

3.4 REPAIR/RESTORATION

A. Coatings:
1. Repair damage to coatings.
a. Touch up damaged coating surfaces using the specified primer for primed steel surfaces, and using zinc-rich primer for galvanized steel surfaces.

3.5 FIELD QUALITY CONTROL

A. Inspection:
1. Verify the adequacy of coatings.
2. Inspect the items provided under this Section for adherence to the fabrication tolerances specified above, and correct any discrepancies:

3.6 PROTECTION

A. Protect the items provided under this Section from damage during the work of other trades.

END OF SECTION

SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, energizing, and testing conduit, tubing, and fittings for communication lines and electrical transmission, distribution, and service lines.

B. Related Section:
   1. Section 01 33 00 - Submittal Procedures.
   2. Section 07 84 00 - Firestopping.
   3. Section 26 05 00 - Common Work Results for Electrical
   4. Section 26 05 26 - Grounding and Bonding.
   5. Section 26 05 28 - Hangers and Supports for Electrical Systems.
   6. Section 26 05 63 – Acceptance Testing for Electrical Systems.

1.2 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI/ASME B1.20.1 - Pipe Threads, General Purpose (Inch).
   2. ANSI C80.1 - Rigid Steel Conduit - Zinc-Coated (GCR).

B. American Society for Testing and Materials (ASTM):
   1. ASTM A 568/A 568M - Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold Rolled, General Requirements for.
   2. ASTM D 1784 - Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

C. National Electric Manufacturer's Association (NEMA):
   1. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
   2. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit.

D. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code (NEC).

E. Underwriters Laboratory, Inc. (UL):
   1. ANSI/UL 6 - Standard for Rigid Metal Conduit.
   2. ANSI/UL 360 - Standard for Liquid-Tight Flexible Steel Conduit.
   3. ANSI/UL 498 - Standard for Safety for Attachment Plugs and Receptacles.
   4. ANSI/UL 514A - Metallic Outlet Boxes.
   5. ANSI/UL 886 - Standard for Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.

F. Institute of Electrical and Electronics Engineers (IEEE):
   1. IEEE C2 - National Electrical Safety Code.

1.3 DEFINITIONS

A. Definitions for all items are as stated in NFPA 70, IEEE C2, and in other reference documents unless otherwise stated, specified, or noted.

1.4 DESIGN REQUIREMENTS

A. Conduit Systems:
   1. Provide conduit of the type and material shown in **Table 26 05 33.13-1, 26 05 33.13-3 and 26 05 33.13-4** for the application indicated, or as indicated on the Contract Drawings.
   2. Provide conduit fittings made of material identical to that of the conduit system with which they are used.

Table 26 05 33.13-1 Conduit System Selection

Location	Condition 1	Condition 2	Conduit Type	Size (Minimum) 1
Under-Ground	Encased	Bends, over 10 degrees in length	Fiberglass Conduit	1 Inch
		Conduit Risers	Fiberglass Conduit	1 Inch
		Exposed conduit within 6-inches of exit from encasement	PVC Coated Rigid Galvanized Steel	1 Inch
		Straight Runs	Fiberglass	1 Inch

1 No conduit smaller than 1-inch trade size is permitted unless indicated otherwise on the Contract Drawings.

Table 26 05 33.13-3 Conduit System Selection				
Location	**Condition 1**	**Condition 2**	**Conduit Type**	**Size (Minimum) 1**
Above-Ground	Outside	NEMA 3R/4/4X locations	PVC Coated Rigid Galvanized Steel	3/4 Inch
	Inside NEMA 1/12	Within 6-inches of floor when exposed	PVC Coated Rigid Galvanized Steel	3/4 Inch
		Within 6-inches of floor when within footprint of floor mounted equipment	PVC Coated Rigid Galvanized Steel	3/4 Inch
		Above suspended ceilings	Rigid Galvanized Steel	3/4 Inch
		Concealed in Open-Cell Masonry Block Wall	Rigid Galvanized Steel	3/4 Inch
		Concealed in Cast-in-Place Concrete Wall or Floor	Rigid Galvanized Steel	3/4 Inch
		Concealed behind Gypsum Board Wall or Ceiling	Rigid Galvanized Steel	3/4 Inch
		1 No conduit smaller than 3/4-inch trade size is permitted unless indicated otherwise on the Contract Drawings.		

Table 26 05 33.13-4 Conduit System Selection				
Location	**Condition 1**	**Condition 2**	**Conduit Type**	**Size (Minimum) 1**
Above-Ground	Inside NEMA 3R/4/4X	Within 6-inches of floor	PVC Coated Rigid Galvanized Steel	3/4 Inch
		Concealed in Masonry Block Wall	Rigid Galvanized Steel,	
		Concealed in Cast-in-Place Concrete Wall or Floor	Rigid Galvanized Steel	3/4 Inch
		Recess Mounted Lighting Fixtures and Rotating or Vibrating Equipment	Liquid-Tight Flexible Metal Conduit	3/4 Inch
		Exposed	PVC Coated Rigid Galvanized Steel	3/4 Inch
		Recess Mounted Lighting Fixtures and Rotating or Vibrating Equipment	Liquid-Tight Flexible Metal Conduit	3/4 Inch
1 No conduit smaller than 3/4-inch trade size is permitted unless indicated otherwise on the Contract Drawings.				

1.5 SUBMITTALS

A. Submit the following information to Metro North Railroad for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
   1. Product Data:
      a. To facilitate power utility approval of the items installed from the utility's service poles to the main service panels, submit 4 more copies of the conduit submittals than the number required by Section 01 33 00, Submittal Procedures.
      b. Fiberglass Conduit
      c. Plastic coated rigid galvanized steel conduit.
      d. Liquidtite flexible metal conduit.
      e. Rigid galvanized steel conduit (RGS).
      f. Fittings for metallic conduit systems.
      g. Conduit spacers.
      h. Heat shrink tubing.
      i. Wall and floor penetration seals.
      j. Cold galvanize coating.
   2. Shop Drawings:
      a. Proposed departures from the original design.
   3. Quality Assurance/Control Submittals:
      a. Qualification Statements:
         1) Qualifications of the installer.
         2) Qualifications of the Electrical Testing Laboratory (ETL).
      b. Certificates:
         1) Testing agency/quality verification, listing, and labeling.

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Installer Qualifications:
      a. Employ an installation firm with a minimum of three years documented experience installing conduit and tubing similar in type and scope to that required by this Contract to install the Work of this Section.
      b. Employ skilled licensed electricians to supervise the Work of this Section.
      c. Submit information verifying the installer's qualifications.
   2. Electrical Testing Laboratory (ETL) Qualifications:
      a. Employ an independent testing agency, qualified as specified in Section 26 05 63, Acceptance Testing for Electrical Systems, to perform the testing required by this Section.
      b. Submit information verifying the ETL's qualifications.

B. Regulatory Requirements:
   1. Perform the Work of this Section in accordance with the requirements specified in NFPA 70 (NEC), and to other applicable state, local, and national governing codes and regulatory requirements.
   2. All items installed from utility service poles to the main service panels must be approved by the serving utility, whether electrical service or telephone service, as listed in Section 26 05 00, Basic Electrical Materials and Methods.

C. Certifications:
1. Provide products that are listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location the product is installed in, and the application intended, unless products meeting the requirements of these nationally recognized testing laboratories are not available or unless standards do not exist for the products.
a. Submit evidence with the Product Data that the products represented meet testing agency quality verification requirements, including agency listing and labeling requirements.
1) Such evidence may consist of either a printed mark on the data or a separate listing card.
b. Submit a written statement from those product manufacturers that do not provide evidence of the quality of their products that indicates why an item does not have a quality assurance verification.
1) Such statements provided in lieu of quality assurance verification are subject to the acceptance of Metro North Railroad.

1.7 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
1. Pack, ship, handle, and unload products in accordance with the requirements of Section 26 05 00, Basic Electrical Materials and Methods, and as detailed herein.

B. Acceptance at Site:
1. Acceptance products at the Site in accordance with the requirements of Section 26 05 00, Basic Electrical Materials and Methods, and as detailed herein.

C. Storage and Protection:
1. Store products in accordance with the requirements of Section 26 05 00, Basic Electrical Materials and Methods, and as detailed herein.
a. Store all products indoors on blocking or pallets.

PART 2 - PRODUCTS

2.1 NON-METALLIC CONDUIT

A. Fiberglass Reinforced Epoxy (FRE) Electrical Conduit and Fittings

2.2 Non-metallic conduit and conduit fittings shall be as follows:

A. Conduit and fittings shall be inside diameter based unless otherwise specified.

B. Conduits and fittings encased in concrete shall have a minimum wall thickness of 0.070-inch for up to 4-inch diameter conduits and 0.096-inch for conduits larger than 4-inch diameter unless otherwise specified.

C. Conduits emerging from concrete encasement and those installed aboveground shall have a wall thickness of not less than 0.25-inch.

D. Conduit and fittings shall be manufactured by Champion Fiberglass, or approved equal.

E. Metallic ties shall not be used when constructing embedded conduit system. Concrete-encased conduits shall be assembled utilizing plastic base and intermediate spacers to provide the minimum required clear spacing between centerlines of parallel conduits.

2.3 Furnish UL listed material in accordance with NEC for underground use.

2.4 Furnish material that has the following minimum properties:

A. Exposed ducts shall conform to NEMA TC-14A.

B. Tensile Strength: The minimum longitudinal tensile strength of the duct shall not be less than 9,000-psi when tested in accordance with ASTM D2105.

C. Dielectric Strength: The minimum dielectric strength shall be 500-volts/mil when tested in accordance with ASTM D149

D. Heat Distortion: The minimum heat distortion temperature shall be 215 degrees Fahrenheit when tested at 264 psi in accordance with ASTM D648.

E. Fire Resistance: FRE duct and fittings shall exceed the standards of UL 651, which requires that vertical specimens shall self-extinguish within five seconds after any of three successive 60-second flame applications.

F. Flame Spread: Surface flammability of conduit and fittings shall not exceed a maximum index rating of 30 when tested under radiant heat in accordance with ASTM E162.

G. Smoke Density: The specific optical density of smoke generated by solid materials in the duct and fittings (in either the flaming or non-flaming mode), shall not exceed 25 within four minutes after start of test, in accordance with ASTM E662.

H. Toxicity: Smoke toxicity shall not exceed the following values in parts per million (ppm):

Gases	Values (max. ppm)
Hydrogen Chloride	0
Hydrogen Bromide	0
Hydrogen Cyanide	1
Hydrogen Sulfide	0
Ammonia	0
Aldehydes as HCHO	10
Oxides of Nitrogen	50
Carbon Dioxide	12500
Carbon Monoxide	70

2.5 Elbows and fittings shall be manufactured from the same resin/hardener/glass systems and by the same filament wound system as the conduit unless noted otherwise

2.6 METALLIC CONDUIT

A. Plastic Coated Rigid Galvanized Steel Conduit:
   1. Provide plastic coated rigid galvanized steel conduit bearing the UL label.
   2. Provide base conduit of rigid hot-dip galvanized steel conduit as specified in Paragraph 2.6.C , and of the type indicated, specified, or scheduled to be coated.
   3. Apply plastic coating in accordance with the following:
      a. Apply a 40-mil thick PVC coating on the outside and a 2-mil thick fusion- bonded blue, red, or green urethane coating on the inside, both coatings conforming to the requirements of NEMA RN 1.
      b. Have the same manufacturer who produces the hot dip galvanized base conduit factory-apply the plastic coating.
      c. Provide plastic coating of one uniform color on all plastic coated rigid galvanized steel conduit provided for the Contract.
   4. Provide 40-mil thick plastic sleeves to protect internally threaded conduit openings.
      a. Provide sleeves with an inside diameter equal to the outside diameter of the conduit/pipe protected by it; and extending either one pipe diameter or 2- inches, whichever is less, beyond the opening.
   5. Manufacturers:
      a. OCAL, http://www.tnb.com/Design Builder/docs/ocal.pdf.
      b. Robroy Industries/Perma-Cote, www.permacote.com.

B. Liquidtite Flexible Metal Conduit:
   1. Provide PVC coated flexible metal conduit conforming to the requirements of Article 350 of NFPA 70 (NEC) for materials and uses and ANSI/UL 360.
   2. Provide conduit with interlocking spiral strip construction capable of bending to a minimum radius of five times its diameter without deforming the spiral strips both inside and outside of the conduit.

a. Provide conduit with a flexible, galvanized, interlocking spiral strip steel core jacketed with smooth, liquid-tight polyvinyl chloride designed to withstand temperatures from minus 40 degrees Celsius to plus 60 degrees Celsius.

3. Finish the interior and exterior of flexible conduit smooth and free from burrs, sharp edges, and other defects that may injure wires; and place the manufacturer's trademark on each length.
4. Furnish an integral continuous copper ground in 1/2-inch through 1-1/4-inch PVC coated flexible metal conduit.
5. Acceptable Manufacturers
   a. Electri-Flex Company, Liquatite®, Type LA, www.electriflex.com.
   b. ANAMET Electrical, Inc., Anaconda Sealtite®, www.anacondasealtite.com.
   c. Or Approved Equal.

C. Rigid Galvanized Steel Conduit (RGS):
1. Provide rigid galvanized steel conduit (RGS) conforming to the requirements of Article 344 of NFPA 70 (NEC) for materials and uses, ANSI C80.1, and UL 6.
2. Fabricate the RGS from mild steel piping, galvanized or sherardized inside and outside, and protected against corrosion by a dichromate rinse or a zinc chromate coating.
3. Provide defect free conduit bearing the UL label, and furnished in 10-foot minimum lengths with both ends threaded and one end fitted with a coupling.
   a. Provide tapered NTP 3/4 inch per foot threads complying with ANSI/ASME B1.20.1.
4. Acceptable Manufacturers:
   a. Tyco/Allied Tube and Conduit, www.alliedtube.com.
   b. Wheatland Tube Company, Division of John Maneely Company, www.wheatland.com.
   c. Approved equal.

2.7 CONDUIT FITTINGS

A. Fittings for Metallic Conduit Systems:
1. Construct conduit bodies/fittings from cast malleable iron or cast steel.
2. For PVC coated raceway systems, provide PVC coated fittings of cast malleable iron or cast steel from the same manufacturer that provides the uncoated conduit bodies/fittings.
3. For RAC raceway systems, provide RAC fittings of aluminum from the same manufacturer that provides the uncoated conduit bodies/fittings. Provide hazardous Class 1, Division 1, Group C & D for NEMA 7 locations.
4. Conduit Outlet Bodies:
   a. Provide malleable iron threaded entry type conduit outlet bodies with neoprene gaskets and cast steel conduit.
   b. Acceptable Manufacturers:
      1) EGS/Appleton Electric, www.appletonelec.com.
      2) EGS/O-Z/Gedney, www.o-zgedney.com.
      3) Or Approved Equal.
5. Conduit Expansion Joints:
   a. Provide telescoping sleeve type galvanized, weatherproof, and vapor tight conduit expansion joints designed for 4-inch maximum expansion with an insulated bushing and lead-wool packing.
   b. Acceptable Manufacturers:
      1) EGS/Appleton Electric, www.appletonelec.com.

2) EGS/O-Z/Gedney, www.o-zgedney.com.
3) Or Approved Equal.

6. Conduit Unions:
   a. Provide conduit unions capable of completing a conduit run when neither conduit end can be turned.
   b. Acceptable Manufacturers:
      1) EGS/Appleton Electric, UNF and UNY Unions, www.appletonelec.com..
      2) Thomas and Betts Company, Erickson® Coupling., www.tnb.com/Design Builder/docs/tbhazardous.pdf
      3) Or Approved Equal.
7. Conduit Outlet Boxes:
   a. Provide malleable or cast iron conduit outlet boxes conforming to the requirements of UL 886, and having a cover with O-rings to keep out moisture.
   b. Acceptable Manufacturers:
      1) EGS/Appleton Electric, GRF outlets and covers, www.appletonelec.com.
      2) EGS/O-Z Gedney, www.o-zgedney.com.
      3) Or Approved Equal.
8. Conduit Device Boxes:
   a. Provide malleable iron conduit device boxes with internal grounding screws and conforming to the requirements of UL 498 and UL 514A.
   b. Acceptable Manufacturers:
      1) EGS/Appleton Electric, FD device boxes, www.appletonelec.com.
      2) EGS/O-Z Gedney, www.o-zgedney.com.
      3) Or Approved Equal.
9. Conduit Sealing Fittings:
   a. Provide, triple coated, malleable iron conduit sealing fittings.
      1) Coat the conduit sealing fittings with zinc electroplate, dichromate, and an epoxy powder coat.
   b. Provide drain fittings in conduit sealing fittings where required.
   c. Provide sealing covers for junction boxes where required.
   d. Acceptable Manufacturers:
      1) EGS/Appleton Electric, www.appletonelec.com.
         a) Sealing hubs: ES.
         b) Sealing fittings: EYSEF, EYSDEF, and EYD.
      2) EGS/O-Z Gedney, www.o-zgedney.com.
      3) Or Approved Equal.

2.8 CONDUIT SPACERS

A. Provide non-metallic, interlocking type conduit spacers which snap together to join any combination of intermediate and base units together, both vertically and horizontally.

B. Manufacturers:
   1. Underground Devices Inc., www.udevices.com.
   2. The George-Ingraham Corp.
   3. Or Approved Equal.

2.9 HEAT SHRINK TUBING

A. Provide all-weather corrosion resistant vinyl plastic heat shrink tubing designed for application on the exterior of metallic conduit to protect against galvanic action, moisture or other deteriorating contaminants.

B. Manufacturers:
   1. Tyco Electronics, Raychem, www.raychem.com.
   2. Thomas & Betts
   3. Or Approved Equal.

2.10 WALL AND FLOOR PENETRATION SEALS

A. Provide watertight mechanical seals capable of holding up to 20 psig, and sealing against water, soil, and backfill material.

B. Acceptable Manufacturers:
   1. Pipeline Seal & Insulator, Inc., Thunderline/Link-Seal, www.linkseal.com.
   2. Flexicraft Industries, PipeSeal, lhttp://flexicraft.com.
   3. Or Approved Equal.

2.11 FINISHES

A. Cold Galvanize Coating:
   1. Provide a cold galvanize coating to provide protection against corrosion by forming an insoluble zinc salt barrier from a cathodic reaction when the coating is damaged by abrasion and exposed to weather.
      a. Provide a single component pre-mixed liquid organic zinc compound producing 95 percent zinc in the dry film.
      b. Provide a coating that bonds to clean iron, steel, or aluminum through electrochemical action.
   2. Acceptable Manufacturers:
      a. ZRC. Worldwide, www.zrcworldwide.com.
      b. Clearco
      c. Krylon
      d. Rustoleum
      e. Or Approved Equal

PART 3 - EXECUTION

3.1 EXAMINATION

A. Although the Contract Drawings are generally indicative of the Work, take field measurements to verify actual conditions.
   1. Due to the small scale of the Contract Drawings it is not possible to indicate all offsets, fittings, and apparatus required or the minor structural obstructions that may be encountered during the Work.

B. Inspect the condition of existing conduit that is required for the Work of this Section.

3.2 PREPARATION

A. After carefully investigating structural and finish conditions and other in-place construction work, prepare and submit detailed Shop Drawings showing proposed departures from the original design due to field conditions or other causes.
   1. Layout the electrical work according to accepted standard electrical trade practice to suit actual field measurements.
   2. Arrange the electrical work to consider existing conditions and to preserve access to other equipment, rooms, areas, and similar features of the construction.
   3. Include plan and profile views of duct banks.
   4. Indicate the location and details of conflicting utility construction and slopes.
   5. Submit these Shop Drawings to Metro North Railroad for approval prior to performing the Work of this Section.

B. Submit Product Data and catalog cuts for all products provided under this Section.
   1. Clearly indicate the usage of each product on the submittal.
   2. Include Product Data for the conduit and tubing provided under this Section with the Operation and Maintenance Manuals.

C. Obtain roughing-in dimensions of electrically operated equipment, including equipment being installed by both electrical and other construction trades.
   1. Set conduit and boxes only after receiving approved dimensions and checking such equipment locations.

D. Remove dirt, debris, and other obstructions from existing conduit required for the Work of this Section by blowing out and mandreling the conduits as applicable.

3.3 INSTALLATION

A. Perform the Work of this Section as specified in Section 26 05 00, Basic Electrical Materials and Methods.

B. Fabricate and install conduit and wireway systems in accordance with accepted electrical trade standard practice.
   1. Layout the electrical work of this Section to suit actual field measurements.
      a. Record the actual installed elevations and locations of duct banks and the as-found locations of conflicting utility lines on the record drawings as specified by Metro North, and submit the record drawings.
   2. Install the electrical Work of this Section in conformance to the wiring methods general requirements of Article 300 in NFPA 70 (NEC), and to all other applicable Articles of NFPA 70 governing wiring methods.
   3. Cut conduit and wireway square, and ream the cut ends according to the requirements of NFPA 70 (NEC) to deburr the openings so that they are not restricted more than cuts made by the material manufacturer.
   4. Avoid bending conduits as much as possible and practical; but if bends are made, use an approved conduit bending tool or machine to make the bends.

5. Do not install crushed or deformed conduit, and remove crushed or deformed conduit from the Site.
6. On conduit that is installed outside, provide a second equipment ground conductor and use fittings with a built-in ground lug for bonding.
7. Provide flexible conduit only to the extent permitted by NFPA 70 (NEC).
    a. In flexible conduits that do not have an integral ground wire, install a green insulated wire in addition to the neutral wire for grounding purposes.
        1) Form a 'J' or 'S' hook with a drip loop to allow flexibility.
        2) Provide a second equipment grounding conductor on outside conduit and provide fittings with built-in ground lug for bonding.
    b. In exposed areas, use PVC coated flexible metal conduit and fittings.
    c. Use flexible metal conduit or liquid tight flexible metal conduit for final connection to recessed lighting fixtures and rotating and vibrating equipment.
        1) Flexible Metal Conduit is only permitted for final connections to lighting fixtures in dry, environmentally conditioned spaces.
        2) Liquid tight flexible metal conduit, as herein specified, for final connection to recess mounted lighting fixtures in unconditioned spaces and to all rotating and vibrating equipment including transformers, motors, solenoid valves, pressure switches, limit switches, generators, engine-mounted devices and pipe-mounted devices.
        3) Flexible conduit not to exceed 18 inches in length for motor connections, 36 inches in length for equipment connections or 72-inches for lighting fixture connections.
8. Provide fittings and apparatus as required to construct the approved electrical design.
    a. Running threads on conduit are not permitted.
        1) Where couplings and connectors are required for metal conduits, use approved threaded couplings and connectors.
    b. Provide conduit unions where necessary to complete a conduit run when neither conduit end can be turned.
    c. Where conduit and raceway runs cross building expansion joints, make provision for expansion in the conduit and raceway runs.
    d. Provide sealing fittings with drain fittings in all lower runs and vertical runs.
    e. Provide sealing covers for junction boxes where required.
    f. Provide weatherproof conduit hubs on all conduit connections exterior to the building, and on instruments, process equipment, and pump motors.
9. Installing RGS and PVC Coated Conduit:
    a. Install RGS and PVC coated conduit using methods and techniques recommended by the conduit manufacturer.
    b. Threading Conduit:
        1) Field thread the conduits per the manufacturers instructions.
            a) For PVC coated conduit, first use a cylindrical guide, oversized to fit over the plastic coating, to neatly cut the coating off at the proposed end of the threads.
            b) Do not damage or remove the coating beyond the proposed end of the threads.
        2) Once the threading operation is complete, protect the newly cut threads against corrosion by applying a "sealing" compound as recommended by the manufacturer.
    c. Assembling RGS and PVC Coated Conduit Fittings:
        1) Use PVC coated conduit bodies, clamps, supports, accessories, and fittings with coated conduit systems.

2) Just prior to assembling each conduit joint, apply the conduit manufacturer's touch-up compound to the end of the conduit in the area normally covered by the fitting sleeve.
3) Use cloth or other material over strap type wrenches to protect the coating while tightening conduits.

10. Breathers and drains shall be provided at the low point(s) of all conduit runs in NEMA 3R, 4, 4X and 7 areas, and where otherwise subject to the accumulation of condensation. Conduits shall be arranged to drain away from dry areas toward damp or wet areas, and away from equipment and enclosures.

C. Exposed Work:
1. In exposed work, run conduit and raceway parallel to centerlines and structure surfaces; or perpendicular to centerlines where required, with right angle turns consisting of symmetrical bends or fittings.
2. Maintain at least 6 inches clearance between conduit and raceway runs and pipes, ducts, and flues of mechanical systems.
3. If a portion of a metallic conduit run, whether plastic-coated or not, extends above grade or is otherwise exposed to personnel, ensure that the conduit is properly bonded to an equipment grounding conductor at both ends.
4. Install the equipment grounding conductor either inside or outside the box.

D. Concealed Work:
1. When performing electrical work in concealed spaces, provide the same quality workmanship as in exposed work.
2. Conceal conduits and raceways in the structure's construction where practicable unless otherwise indicated on the Contract Drawings or required by the Engineer.
a. Group conduit and raceway runs in concealed work as much as practical to avoid congesting the concealed spaces.
b. Do not weaken the structure by excessive or unnecessary cutting.
1) Only make cuts into the structure's construction in conformance to the applicable building codes.
3. Conduits and Raceways Embedded in Concrete Slabs:
a. Separate multiple conduits encased together by not less than two inches of concrete.
b. Locate conduit installed in floor slabs within the reinforced area of the slab.
c. Where conduit crosses expansion joints, provide weather tight expansion and defection fittings and bonding jumpers.
4. Install below grade conduit in conformance with the requirements of Section 33 71 19, Underground Ducts and Manholes.
a. For conduits that pass under building support walls, provide a minimum of 3 inches of concrete encasement all around.
b. For underground and concrete encased duct banks, provide non-metallic conduit spacers.
1) Provide sufficient space to allow pouring the concrete envelope without displacing or shifting the individual conduits.
2) Install conduit spacers at intervals not exceeding five feet.

E. Hangers and Supports:
1. Install auxiliary support structures, anchors, and fasteners as specified in Section 26 05 28, Hangers and Supports.

a. Mount or suspend conduit and wireway systems directly on structural members of the structures and walls.
b. Do not attach conduit or raceway systems to suspended ceiling members or to the suspending mediums.
c. Securely attach anchors into walls.

2. At all conduit attachments, allow space between the mounting surfaces and the conduit by providing U-channel supports, clamp-backs, or spacers.
   a. Attach wall-mounted conduit runs close to the walls following the contour of the walls, parallel to the walls and other building lines except at bends.

F. Structure Penetrations:
1. Make penetrations in existing concrete structures by core-drilling.
   a. Drill the penetrations true, clean, and free from spalling.
2. At penetrations through fire rated floors, walls, and similar assemblies, provide firestopping as specified in Section 07 84 00, Firestopping.
3. Make floor penetrations as detailed on the Contract Drawings.
   a. Seal all conduit penetrations through floor slabs on grade in buildings with a floor penetration seal.
4. Install a wall penetration seal at all wall penetrations.
   a. Size wall penetrations to accommodate the conduit outside diameter plus either 1/4 inch or a hole allowance to allow the installation of the wall penetration seal.
5. For conduits that enter rooms from concrete floors or masonry, provide corrosion protection by using an RGS or PVC coated conduit that extends from 12 inches inside the concrete or masonry to at least 6 inches into the room.

G. Hazardous Locations
1. Within the areas labeled as “hazardous” on the Contract Drawings, only provide equipment, fittings, and wiring as indicated which are approved for Class 1, Division 1, Group D or Class II, Division 1, Group F locations as required by NFPA 70 (NEC) for the type of area in question and as specifically designed for this type of hazardous use.
2. In hazardous locations, engage at least five full threads on conduit connections to couplings and fitting hubs.
   a. Coat the threads with a sealing compound that makes the connections gas tight
3. Properly install sealing fittings at all required locations in accordance with code regulations.

H. Wiring:
1. Install wiring in conduit as indicated.
2. Prior to the installation of any wire, verify that the conduit is clean and free of debris.
3. Install a separate ground conductor within every conduit.

3.4 FIELD QUALITY CONTROL

A. Inspection:
1. Inspect installed conduit runs for obstructions, proper support, proper grounding, and completeness.
2. Record the actual installed elevations and locations of conduit and tubing on record drawings specified by Metro North.

END OF SECTION

SECTION 26 05 33.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, connecting, cleaning, and protecting electrical pull and junction boxes.

B. Related Section:
   1. Section 01 33 00 - Submittal Procedures.
   2. Section 26 05 00 - Common Work Results for Electrical.
   3. Section 26 05 26 - Grounding and Bonding.
   4. Section 26 05 28 - Hangers and Supports for Electrical Systems.
   5. Section 26 05 63 – Acceptance Testing for Electrical Systems.
   6. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables.
   7. Section 26 05 33.13 - Conduit for Electrical Systems.

1.2 REFERENCES

A. National Electric Manufacturer's Association (NEMA):
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
   2. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable.
   3. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

B. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code (NEC).

C. American National Standards Institute (ANSI):
   1. ANSI Z55.1 - Gray Finishes for Industrial Apparatus & Equipment (*withdrawn 1990, no replacement*).

D. Underwriters Laboratories, Inc. (UL):
   1. UL 886 - Standard for Outlet Boxes and Fittings for Use In hazardous (Classified) Locations.

1.3 SUBMITTALS

A. Submit the following information to the Engineer for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
   1. Product Data:
      a. List of the proposed materials.

b. Catalog cuts of cast outlet boxes for general purpose applications used with steel conduit systems.
c. Catalog cuts of cast outlet boxes for general purpose applications used with coated conduit systems.
d. Catalog cuts of sheet metal boxes for general purpose applications in dry locations.
e. Catalog cuts of outlet boxes for hazardous locations.
f. Catalog cuts of pull boxes for hazardous locations.
g. Catalog cuts of equipment and control device enclosures for all areas except outdoor and corrosive locations.
h. Catalog cuts of equipment and control device enclosures for outdoor locations.
i. Catalog cuts of equipment and control device enclosures for corrosive locations.

2. Quality Assurance/Control Submittals:
   a. Design Data.
      1) Manufacturer's comprehensive calculations.
   b. Test Reports.
      1) Factory test reports.
   c. Certificates.
      1) Testing agency/quality verification, listing, and labeling.
   d. Qualification Statements.
      1) Qualifications of the licensed electricians.
      2) Qualifications of the Electrical Testing Laboratory (ETL).

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Installer Qualifications:
      a. To supervise installation of the Work of this Section, employ licensed electricians.
         1) Submit the qualifications of the licensed electricians supervising the Work of this Section.
   2. Electrical Testing Laboratory (ETL) Qualifications:
      a. Employ an independent testing agency, qualified as specified in Section 26 05 63, Electrical Testing, to perform testing required by this Section.
      b. Submit information verifying the ETL's qualifications.

B. Regulatory Requirements:
   1. Perform the Work of this Section in accordance with the requirements specified in Articles 250, 300, and 370 of NFPA 70 (NEC), and to all other applicable state, local, and national governing codes and regulatory requirements.

C. Certifications:
   1. Provide products that are listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location installed in, and listed and labeled or approved for the application intended as indicated or specified, unless products meeting the requirements of these testing laboratories are not readily available or unless standards do not exist for the products.
      a. Provide products that are approved, listed, and labeled for the short circuit currents, voltages, and currents indicated or specified to be applied.
      b. Provide service entrance labeled products for all service entrance equipment.

2. Submit evidence of testing agency/quality verification, listing, and labeling for each product with the submitted product data, either by providing a printed mark on the data or by attaching a separate listing card.
   a. For items without such evidence, submit a written statement from the product manufacturer that indicates why it does not have quality assurance verification.

1.5 MATERIAL DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Pack, ship, handle, and unload products in accordance with the requirements of Section 26 05 00, Basic Electrical Materials and Methods.

B. Acceptance at Site:
   1. Accept products at the Site in accordance with the requirements of Section 26 05 00, Basic Electrical Materials and Methods.

C. Storage and Protection:
   1. Store products in accordance with the requirements of Section 26 05 00, Basic Electrical Materials and Methods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Use of Trade Names:
   1. The use of trade names within the Contract Documents is intended to establish the basis of design and to illustrate the constructability and level of quality required.
   2. The use of trade names is not intended to exclude other manufacturers whose products are equivalent to those named, subject to compliance with Contract requirements.

2.2 MANUFACTURED UNITS

A. Steel Outlet and Device Boxes for General Purpose Applications:
   1. For general purpose applications in dry, flush (in-wall) locations only, provide UL Listed galvanized steel outlet and device boxes conforming to NEMA OS 1.
      a. Boxes shall be fabricated from steel not less than 0.062" thickness.
      b. Boxes shall have standard trade size knockouts to facilitate conduit and cable connector attachments.
      c. Boxes shall be equipped with one 10-32 tapped hole for ground wire attachment.
   2. Manufacturers:
      a. Appleton Electric
      b. O-Z/Gedney
      c. Crouse Hinds
      d. Thomas & Betts
      e. Or Approved Equal

B. Cast Outlet Boxes for General Purpose Applications:

1. For Use with Steel Conduit Systems:
   a. For use with steel conduit systems, provide UL Listed small cast steel or cast malleable iron outlet boxes with threaded hubs that meet the NEMA 250 requirements for Type 12 enclosures.
   b. If covers are indicated or specified, provide cast steel or cast malleable iron covers with neoprene gaskets.
      1) Provide captive Type 316 stainless steel mounting screws for the covers.
   c. If fixture hangers are indicated or specified, provide ball type cast steel or cast malleable iron fixture hangers with neoprene gaskets.
      1) Provide captive Type 316 stainless steel mounting screws for the fixture hangers.
   d. Finish:
      1) Provide outlet boxes, covers, and hangers with an electroplated zinc coating, followed first by a dichromatic prime, and then by an aluminum polymer finish coating conforming to NEMA FB 1.
   e. Manufacturers:
      1) Appleton Electric
      2) O-Z/Gedney
      3) Crouse Hinds
      4) Thomas & Betts
      5) Killark
      6) Or Approved Equal.
2. For Use with Coated Conduit Systems:
   a. When boxes for use with coated conduit systems are indicated or specified, provide cast outlet boxes as specified for steel conduit systems, but having coatings as specified in Section 26 05 33.13, Conduit and Tubing, for the system.
      1) Provide a 40 mils thick PVC coating conforming to the requirements of NEMA RN 1 outside, and a 2 mils thick fusion-bonded blue, red, or green urethane coating inside.
         a) Insure that the color of the PVC coating is uniform throughout the Work of this Contract.
      2) For internally threaded openings in the box, provide a 40 mil thick plastic sleeve extending one pipe diameter or 2 inches, whichever is less, beyond the openings with an inside sleeve diameter equal to the outside diameter of the conduit or pipe used.
   b. Manufacturers:
      1) Thomas & Betts, Ocal
      2) Robroy Industries
      3) Or Approved Equal

C. Sheet Metal Junction and Pull Boxes for General Purpose Applications:
   1. For general purpose applications in dry locations, provide small sheet steel pull and terminal boxes and covers that meet the NEMA 250 requirements for Type 12 enclosures with continuously welded and ground smooth seams, and having no holes or knockouts.
      a. Cover:
         1) Provide overlapping sheet steel screw covers with captivated screws for each box.
         2) Provide a means of bonding on the cover.
      b. Gasket: Provide an oil resistant cover gasket for each box.
      c. Mounting Brackets:
         1) Provide 12 gauge steel wall-mounting brackets.

d. Finish:
1) Provide polyester powder coating applied over phosphatized surfaces.
2) Color: ANSI Z55.1 Number 61 gray.

2. Manufacturers:
a. Hoffman, Screw Cover SC Junction Boxes
b. Rittal Corp
c. Milbank Manufacturing
d. Or Approved Equal

D. Outlet Boxes for Hazardous Locations:
1. For hazardous locations, provide junction boxes and covers that comply with the requirements of UL 886, and are sized according to the installation and NFPA 70 (NEC) requirements.
2. For suspended type or surface mounted conduit runs in hazardous locations, provide outlet boxes having a threaded cover and the proper size and number of tapped conduit hub openings.
a. Outlet Box Body:
1) Fabricate outlet box bodies from iron alloy, electrogalvanized and coated with aluminum acrylic paint.
2) Provide threaded access openings that can either accommodate threaded covers that create a seal against the hazard, or that allow the outlet box depth to be increased by using threaded extensions.
3) Provide taper-threaded hubs in the box capable of accommodating threaded rigid or IMC conduit, and having smooth integral hub bushings to protect conductor insulation during wire pulling.
4) Provide an internal ground screw.
b. Outlet Box Covers:
1) Provide copper-free aluminum threaded covers with cast “ears”, recesses, or other means to facilitate tightening and removing the cover.
a) Provide a neoprene O-ring with the cover.
2) If required, in lieu of providing standard covers provide threaded sealing covers having a removable threaded plug to allow the enclosure to be filled with sealing compound.
3) If required, in lieu of providing standard covers provide threaded covers or canopies capable of mounting pendant type lighting fixtures.

3. Manufacturers:
a. Cooper Crouse Hinds Company, GUA and GUR Series Outlet Boxes
b. Appleton Electric
c. O-Z/Gedney
d. Thomas & Betts
e. Or Approved Equal.

E. Pull Boxes for Hazardous Locations:
1. For hazardous locations, provide pull boxes and covers that comply with the requirements of UL 886, and are sized according to installation and NFPA 70 (NEC) requirements.
a. Pull Box Body:
1) Provide copper-free aluminum or iron alloy bodies capable of being factory or field drilled and tapped for conduit entries of the proper size and number.
2) Machine enclosures to accommodate field installed mounting plates.
3) Provide an internal ground lug.

b. Pull Box Cover:
   1) Provide threaded, bolted, or hinged and bolted covers, fabricated from copper-free aluminum or iron alloy, as required.
      a) Provide bolts for attaching bolted covers.
      b) Provide hinges for hinged covers.
   2) Provide a neoprene gasket with each cover.
c. Manufacturers:
   1) Cooper Crouse Hinds Company, GUB and EJB Series Junction Boxes
   2) Appleton Electric
   3) O-Z/Gedney
   4) Thomas & Betts
   5) Or Approved Equal.

F. Equipment and Control Device Enclosures:
1. For all areas except outdoor and corrosive locations, provide enclosures with hinged doors that meet the NEMA 250 requirements for Type 4 or 12 enclosures, depending on Contract requirements.
   a. Enclosure Cabinet:
      1) Provide sheet steel boxes having continuously welded seams, ground smooth.
      2) Provide enclosures having no holes or knockouts.
   b. Enclosure Door:
      1) Provide overlapping sheet steel hinged doors, having a continuous hinge with a removable heavy gauge hinge pin and door clamps with screws to provide a watertight seal or to exclude liquids and contaminants.
      2) Provide a means of bonding on the door.
   c. Door Gasket:
      1) Provide an oil resistant door gasket for each box.
   d. Security:
      1) Provide a mechanism for padlocking the enclosure.
   e. Finish:
      1) Provide polyester powder coating applied over phosphatized surfaces.
      2) Color: ANSI Z55.1 Number 61 gray.
   f. Manufacturers:
      1) Hoffman, Single-Door Type 4 Enclosures or Type 12 and Type 13 Enclosures
      2) Rittal Corp
      3) Milbank Manufacturing
      4) Or Approved Equal
2. For outdoor and corrosive locations, provide enclosures that meet the NEMA 250 requirements for Type 4X enclosures, and as follows:
   a. Enclosure Cabinet:
      1) For wall mounted enclosures, fabricate enclosure bodies from 14 gauge Type 304 or Type 316L stainless steel sheets; and having continuously welded seams, ground smooth.
      2) For floor mounted enclosures, fabricate enclosure bodies from 12 gauge Type 304 stainless steel sheets and enclosure backs from 10 gauge Type 304 stainless steel sheets; and having continuously welded seams, ground smooth.
         a) Provide stainless steel floor stands, if required.
         b) Provide stainless steel lifting eyes.

3) Provide a grounding stud on the enclosure body.
4) Provide enclosures having no holes or knockouts.
5) Provide a drip shield on the top, and seam-free sides, fronts, and backs.

b. Enclosure Doors:
1) For wall mounted enclosures, provide a removable hinged door fabricated from 14 gauge Type 304 or Type 316L stainless steel sheets; and having a rolled lip on three sides and a continuous stainless steel hinge with a removable hinge pin on the fourth side.
a) Provide a stainless steel door clamp assembly that assures a watertight seal.
2) For floor mounted enclosures, provide either doors similar to those specified for wall mounted enclosures, or 14 gauge Type 304 or Type 316L stainless steel sheets hinged doors with concealed die-cast hinges that allow 180 degree door opening and easy door removal.
3) Provide a means of bonding on the door.

c. Door Gasket:
1) Provide a seamless, foam-in-place, oil-resistant door gasket for each enclosure.

d. Security:
1) Provide a mechanism for padlocking the enclosure.

e. Finish:
1) Provide enclosures with unpainted, Number 4 brushed finish surfaces.

f. Manufacturers:
1) Hoffman, Type 4X Enclosures and General Purpose Two-Door Floor-Mount Type 4X Enclosures
2) Rittal Corp
3) Milbank Manufacturing
4) Or Approved Equal

G. Ground Lug/Bus Bar:
1. Provide a copper ground lug or a 1/4-inch by 2-inch copper bus bar in large pull and junction boxes.

2.3 SOURCE QUALITY CONTROL

A. Tests:
1. Submit factory test reports to the Engineer as specified for the products in this Section.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Install the work of this Section only under the supervision of licensed electricians.

3.2 EXAMINATION

A. Verify that conduit stub-ups to be mated with electrical boxes and enclosures are the correct type and size, and are at the proper location.

3.3 INSTALLATION

A. Junction Boxes and Pull Boxes for General Purpose Applications:
   1. For general purpose applications in dry locations, provide small sheet steel pull and terminal boxes that meet the NEMA 250 requirements for Type 12.
   2. Provide boxes that are fabricated from the same type of material as the conduit with which the boxes are used.

B. Junction Boxes and Pull Boxes for Hazardous Locations:
   1. Provide junction boxes rated for the hazard classification of the area where they are installed, whether explosionproof, dust-ignition-proof, raintight, wet locations, watertight, or other classification.

C. Equipment and Control Device Enclosures:
   1. For all areas except outdoor and corrosive locations, provide enclosures that meet the NEMA 250 requirements for Type 4 or 12 enclosures
   2. For outdoor and corrosive locations, provide enclosures that meet the NEMA 250 requirements for Type 4X stainless steel enclosures.

D. Installing Boxes for Electrical Outlets and Devices:
   1. Install boxes level and plumb within 1/16-inch of vertical or horizontal over the length of the box.
   2. Install device boxes at a uniform height as indicated on the Contract Drawings.
      a. Mount all adjacent boxes in alignment at the same mounting height.
      b. Mount outlet boxes for equipment within 18-inches of the equipment power connection.
   3. Do not install flush mounting boxes back-to-back in walls.
      a. Provide a minimum separation of 6 inches (150 mm).
      b. Provide a minimum separation of 24inches (600 mm) s in acoustic rated walls.
   4. When installing boxes outside or to exposed conduit in unfinished areas, provide cast boxes.
      a. Mount these boxes on spacers to be 1/8-inch from wall unless box has built- in raised pads to perform the same function.
   5. When installing boxes for single devices, two devices, or wall outlets, install 4- inch square boxes with appropriate plaster rings.
      a. Space boxes on opposite sides of the wall 6 inches apart.
      b. Set plaster rings flush or to protrude less than 1/16-inch from the wall.
      c. Openings for boxes in finished walls must be within 1/16-inch of the box.
         1) Correct all oversize openings in accordance with the specifications for the wall material.
   6. Outlet boxes must be of the one-piece type, the use of expandable sheet metal boxes is prohibited.
   7. Support cast boxes for outlet and device using one of the following methods:
      a. Mount the boxes directly to the structure using 4 or more anchors.
         1) Attach mounting screws to feet located outside of the box interior.

2) Provide 1/4-inch spacers behind the boxes unless the box has raised pads.

b. Attach the box to two 1-inch or larger conduits which are supported within 12-inches of the box.

c. Attach the box to two 1-inch or larger conduits which exit from a poured concrete floor no further than 18-inches from the box.

E. Installing Boxes for Other than Electrical Outlets and Devices:

1. Accurately punch holes for conduit openings using a hydraulic punch and punches sized for the conduit to be installed.
2. Install a conduit breather in the top of the box and a conduit drain fitting in the bottom of all boxes not located in bone-dry areas that are at least 100 feet from a hose-bib.
3. Support boxes for other than electrical outlets and devices using one of the following methods:
   a. Mount the boxes directly to the structure using 4 or more anchors.
      1) Attach mounting screws to feet located outside of the box interior or seal the screw holes to prevent water penetration.
      2) Provide 1/4-inch spacers behind the boxes unless the box has raised pads.
   b. Attach the box to two 1-inch or larger conduits which are supported within 12-inches of the box.
   c. Attach the box to two 1-inch or larger conduits which exit from a poured concrete floor no further than 18-inches from the box.
   d. Mount the box on U-channel and structural supports conforming to Section 26 05 28, Hangers and Supports.

F. Make up all conduit connections to boxes in accordance with the requirements of Section 26 05 33.13, Conduit for Electrical Systems.

G. Install wiring in boxes in accordance with the requirements of Section 26 05 19, Low- Voltage Electrical Power Conductors and Cable.

H. Ground boxes in conformance with Section 26 05 26, Grounding and Bonding.

3.4 REPAIR/RESTORATION

A. Touch up damaged coatings on electrical boxes and enclosures.

3.5 FIELD QUALITY CONTROL

A. Site Tests:
1. Test all boxes to verify that they are properly connected to the grounding system.

B. Inspection:
1. Inspect flush boxes to verify that the opening between the box and the wall finish is less than 1/16-inch.
2. Inspect flush boxes to verify that each box is flush with the wall, or protrudes less than 1/16-inch, and is not set behind the wall surface.
3. Inspect surface mounted boxes to verify that they are level and plumb within 1/16-inch as specified.

4. Record the actual installed elevations and locations of pull and junction boxes on record drawings specified by Metro North.

3.6 CLEANING

A. Waste Management and Disposal:
   1. Clear and dispose of waste materials in accordance with the requirements of Section 26 05 00, Basic Electrical Materials and Methods.

3.7 PROTECTION

A. Except for surfaces to be painted, mask electrical boxes to protect them from paint overspray or over-brushing during painting operations.

B. Protect boxes against damage from other work.

END OF SECTION

SECTION 26 05 48 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This dual-purpose section provides for vibration isolation as well as seismic control for the "equipment" as listed below. This specification is part of the general conditions for the Electrical contract.

1.2 REFERENCES

A. International Building Code (IBC)
   1. IBC 2012

1.3 DESCRIPTION

A. Intent:
   1. All equipment listed below and conduit shall be seismically braced. Vibration control shall apply as described herein.
   2. Seismic bracing and isolation materials shall be of the same manufacturer and shall be certified by the manufacturer.
   3. It is the intent of the seismic portion of this specification to keep all electrical building system components in place during a seismic event and operational.
   4. All such systems must be installed in strict accordance with seismic codes, component manufacturer's and building construction standards. Whenever a conflict occurs between the manufacturers or construction standards, the most stringent shall apply.
   5. This specification is considered to be minimum requirements for seismic consideration.
   6. Any variance or non-compliance with these specification requirements shall be corrected by the Contractor in an approved manner.

B. The work in this section includes, but is not limited to the following:
   1. Vibration isolation for equipment.
   2. Seismic restraints.
   3. Certification of seismic restraint designs and installation supervision.
   4. Certification of seismic attachment of housekeeping pads.
   5. All equipment, (components) requiring IBC certification.
   6. All inspection and test procedures for equipment, (components) requiring IBC certification.
   7. All electrical equipment and systems within or on the building. Equipment buried underground is excluded but entry of services through the foundation wall is included. Equipment referred to below is typical. (Equipment not listed is still included in this specification).
   8. For IBC projects, all systems listed in or part of this paragraph are referred to as components.

Battery Chargers Light Fixtures

Battery Racks	Motor Control Centers
Bus Ducts	Supports
Cable Trays	Switchboards
Conduit	Transformers
Electrical Panels	Variable Frequency
Controllers Equipment Supports	

C. Definitions (all codes):
   1. Life Safety Systems:
      a. All systems involved with fire protection including sprinkler piping, fire pumps, jockey pumps, fire pump control panels, service water supply piping, water tanks, fire dampers and smoke exhaust systems.
      b. All mechanical, electrical, plumbing or fire protection systems that support the operation of or are connected to emergency power equipment including all lighting, generators, transfer switches and transformers.
      c. Automated supply, exhaust, fresh air and relief air systems on emergency control sequence including air handlers, duct, dampers, etc.
   2. Positive Attachment:
      a. Positive attachment is defined as a cast-in anchor, a drill-in wedge anchor, a double-sided beam clamp loaded perpendicular to a beam, or a welded or bolted connection to structure. Single sided "C" type beam clamps for support rods of overhead piping, duct work, fire protection or any other equipment are not acceptable on this project as seismic bracing points.
   3. Transverse Bracing:
      a. Restraint(s) applied to limit motion perpendicular to the centerline of the pipe or duct.
   4. Longitudinal Bracing:
      a. Restraint(s) applied to limit motion parallel to the centerline of the pipe or duct.
   5. Refer to Chapter 16 of the IBC 2009 for additional definitions.

1.4 QUALITY ASSURANCE

A. Substitution of internally or externally isolated and restrained equipment supplied by the equipment vendor, in lieu of the isolation and restraints specified in this section, is acceptable provided all conditions of this section are met. The Equipment manufacturer shall provide a letter of guarantee from their Engineering Department P.E. stamped and certified per the section on Seismic Restraint Design (paragraph 1.05) stating that the seismic restraints are in full compliance with these specifications.

B. Letters from field offices or representatives are unacceptable. All costs for converting to the specified vibration isolation and/or restraints shall be borne by the equipment vendor in the even of non-compliance with the preceding.

C. Letters from representatives are unacceptable.

1.5 SUBMITTAL DATA REQUIREMENTS

A. Refer to Section 26 05 00.

B. The manufacturer of vibration isolation and seismic restraints shall provide submittals for products as follows:
   1. Descriptive Data:
      a. Catalog cuts or data sheets on vibration isolators and specific restraints detailing compliance with the specification.
      b. Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and seismic restraints by referencing numbered descriptive drawings.
   2. Shop Drawings:
      a. Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.
      b. Provide all details of suspension and support for ceiling hung equipment.
      c. Where walls, floors, slabs or supplementary steel work are used for seismic restraint locations, details or acceptable attachment methods for ducts and pipe must be included and approved before the condition is accepted for installation. Restraint manufacturers' submittals must include spacing, static loads and seismic loads at all attachment and support points.
      d. Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.
   3. Seismic Certification and Analysis:
      a. Calculations by the Manufacturer's qualified licensed Engineer substantiating the mounting system, seismic restraints and recommended anchor bolts shall e submitted for approval along with the shop drawings. Calculations shall be based on the loads as established in the table at the end of this section. All analysis shall be stamped by a registered professional having a P.E. from the same state as the project.
      b. Unless otherwise specified, all equipment and conduit shall be restrained to resist seismic forces. Restraints shall maintain equipment or conduit in a captive position. Restraint devices shall be designed and selected to meet seismic requirements as defined in the latest issue of:
         1) Applicable state and local codes
         2) IBC International Building Code
   4. International Building Code Additions: In addition to all of the above provisions, Contractor shall comply with sections 16 and 17 of the International Building Code using only vendors that comply with the provisions stated herein and submitting the special inspections listed within these specifications. Where compliance is not possible, each Contractor shall submit a vendor report clearly indicating that none of the specified, listed or other vendors known to the Contractors meet the compliance, testing and certification portions of the IBC spec section 16 and 17. Special inspections shall still be conducted even if no vendors meet the enclosed requirements. All non-isolated and isolated equipment, (components) shall be secured to the structure in accordance with that code.
      a. All component manufacturers shall submit for approval the following as required below:
         1) All life safety system components noted in this specification will have the manufacturer of that component submit the Approved Agencies Certificate of Compliance for the specific equipment on this project when the Seismic Design Category is "C – F". Analytical or shaker test certification thru the component's load path including structure at its center of gravity shall include anchorage, structural and online capability.
         2) All components noted in this specification will have the manufacturer of that component submit the Approved Agencies Certificate of Compliance for their equipment when used on a Seismic Design Category is "C-F". This

requirement also pertains to projects that combine an emergency preparedness center within a structure of another Occupancy Category where that component is needed for continued operation of the building or whose failure could impair the continued operation of the building. Note: the definition of the above refers to any component which does not allow or hampers the use or capability of the intended purpose of that structure Analytical or shaker test certification thru the total component's load path to structure at its center of gravity shall include anchorage, structural and on-line capability.

3) All components containing hazardous or flammable materials will have the manufacturer of that component submit the Approved Agencies Certificate of Compliance for their equipment when used on any project having a minimum Seismic Design Category of "C-F". Analytical or Shaker Test Certification thru the total component's load path to structure at its center of gravity shall include anchorage and structural capability to insure against loss of hazardous or flammable, (explosive) material.

4) All components that are not listed in the above categories shall have the manufacturers of each component submit a PE stamped calculation package that their project specific equipment will accept anchorage through the component's load path to structure at its center of gravity at the designated anchorage locations. This requirement is for all projects having a Seismic Design Category of (C-F).

b. The following systems shall require Special Inspection and Periodic Special Inspection for anchorage during the course of construction as defined earlier in this section for all buildings in Seismic Design Categories C-F.

1) All electrical components for standby or emergency power systems require Periodic Special inspection.
2) All flammable, combustible and highly toxic piping and their associated mechanical systems.
3) All equipment using combustible or toxic energy sources.
4) All electric motors, transformers, switchgear unit substations and motor control centers.
5) Reciprocating and rotting type machinery.
6) Conduit, 3" and larger.
7) Isolator units for seismic isolation system.

C. Contractor Responsibilities and Approvals:

1. Each Contractor responsible for the installation of the components above shall be responsible for submitting to the design team for their approval a written Contractor's statement of responsibility as outlined below.
   a. Identify the components that are part of the Quality Assurance Plan.
   b. Identify all Special Inspection and Testing.
   c. List control procedures within the Contractor's organization including methods and frequency of reporting and their distribution.
   d. List personnel and their qualifications exercising control over the seismic aspects of the project.

D. Design Loads:

1. Projects will have a maximum design load of .4g for statically mounted components and .9g for resiliently mounted components.

2. The minimum horizontal restraint capability shall be 0.4 g horizontal and .27 vertical. Life safety equipment defined above shall be designed to survive a horizontal load of .9g and a vertical load of .6g.
3. Testing or calculations (including the combining of tensile and shear loadings) to support seismic restraint designs must be stamped by a registered Professional Engineer with at least five years of seismic design experience and licensed in the state of the job location. Testing and calculations must include shear and tensile loads as well as one test or analysis at 45° to the weakest mode. IBC Component testing must be by an Approved Agency.
4. Analysis for anchorage must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the forces detailed in Section 4 acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.
5. Vertical load shall be calculated at 2/3 the horizontal load.
6. Internally isolated equipment in lieu of specified isolation and restraint systems must meet the specified isolation and system restraint criteria.
7. A seismic design Errors and Omissions insurance certificate MUST accompany the equipment manufacturer's certification. Product liability insurance certificates are not acceptable.
8. In the event that the equipment is internally isolated and restrained, the entire unit assembly must be seismically attached to the structure. Curb or roof rail mounted equipment must not only have seismic attachment of the equipment to the roof but also to the curb or rails. The attachment and certification thereof shall be by this section.

1.6 RELATED WORK

A. Housekeeping pad design shall be as indicated on the drawings. Attachment shall be designed and certified according to this section by the seismic/isolation supplier. Material and labor required for attachment and construction shall be by the Contractor. Housekeeping pads shall be sized to accommodate a minimum of six (6) inches of clearance all around the equipment or 12 times the anchor bolt diameter, whichever is greater and its mounting package. Structural support and connections for all equipment, including roof-mounted equipment, specified in other sections shall comply with all IBC requirements indicating load path to the structure.

B. Lay-in ceilings in compliance with seismic zone requirements may use earthquake clips or other approved means of positive attachment to brace fixtures such as lights and diffusers less than 75 pounds to T-bar structures. Local codes dictate support requirements.

1.7 CODE AND STANDARDS REQUIREMENTS

A. Applicable Codes and Standards:
   1. All City, State and Local Codes.
   2. American Society For Testing and Materials (ASTM) Standard.
   3. International Building Code (IBC).

B. In cases where requirements vary, the guideline for the most stringent shall be utilized.

C. Use IBC-2009 as reference code standard unless otherwise designated.

1.8 MANUFACTURER'S RESPONSIBILITY

A. Manufacturer of vibration isolation and seismic control equipment shall have the following responsibilities:
   1. Determine vibration isolation and seismic restraint sizes and locations.
   2. Provide vibration isolation and seismic restraints as scheduled or specified.
   3. Provide calculations and materials if required for restraint of unisolated equipment.
   4. Provide installation instructions, drawings and trained field supervision to insure proper installation and performance.
   5. Certify correctness of installation upon completion.
   6. All provisions of section1.5.B.3. Seismic Certification & Analysis.

B. All manufacturers providing equipment and/or vibration/seismic control systems must provide a Seismic Design Error and Omissions Insurance Certificate for their firm or their design consultant to certify their ability to provide engineering and design as required by this Section.

C. All manufacturers' including Original Equipment Manufacturers (OEM) are responsible for Section 1.1 through 1.8, including 1.5.B.3. Seismic Certification & Analysis.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. All vibration isolation and seismic devices described in this section shall be the product of a single manufacturer.

B. Design of hardware and devices such as beam clamps, anchor bolts, cable and cast- in-place plates must be by this section's supplier to ensure seismic compliance and certification. The Contractor has the option to utilize alternate fastening devices (anchor bolts) so long as the sizing and dimensions on seismic submittals are followed.

C. Unless otherwise specified, all isolator hardware shall be zinc plated. Springs with a deflection of up to 2 inches shall be coated with a polyester epoxy powder. Springs and rubber isolators shall be color coded for proper identification of rated load capacity. Zinc plating shall conform at ASTM B633, Class 2 SC2, minimum. All other metal parts used outdoors shall be hot spray or hot dipped galvanized.

2.2 VIBRATION ISOLATION AND SEISMIC RESTRAINT TYPES

A. Double Deflection Neoprene:
   1. Double deflection neoprene mountings shall have a minimum rated static deflection of 0.40 inches. Steel top plate and base plate shall be completely bonded and embedded in oil-resistant elastomer. Mountings shall be molded in color for ease of identification of load capacity, and shall have ribbed neoprene surfaces on top and bottom to provide friction pads for those applications, which do not need to be bolted to the floor or to

equipment. Bolt holes shall be provided on the bottom plate, and a tapped hole on the top, for applications requiring positive tie down.

2. Acceptable Manufacturers:
   a. Vibration Mountings and Controls, Inc.
   b. Mason Industries.
   c. Vibration Eliminator.

B. Floor Mounted Spring Isolators:
1. Free standing spring-type isolators, shall be laterally stable without housing, snubbers, or guides, and shall include a steel reinforced, ribbed neoprene cup (¼ inch minimum thickness) between the baseplate and the support. Mountings shall have leveling bolts on the top, consisting of an adjusting bolt, cap screw and washer. Mountings shall include a bolt hole in the bottom cup or a two hole rectangular steel baseplate for bolting to the structure.
2. Springs shall not be welded to the baseplate or cup. Spring diameters shall be no less than 0.8 times the compressed height of the spring at rated load. Springs shall also have a minimum additional travel to solid equal to 50% of the rated deflection.
3. Acceptable Manufacturers:
   a. Vibration Mountings and Controls, Inc.
   b. Mason Industries.
   c. Vibration Eliminator.

C. Housed Springs With Limit Stops:
1. Free standing, laterally stable spring type isolators. Isolator is the same as described in Specification 2.02.B, except that it includes a housing to provide vertical limit stops to prevent spring extension during weight changes, or when equipment is exposed to uplift loads such as wind loading. The housing serves as blocking during erection, and shall be located between the equipment and supporting structure. There shall be a minimum clearance of ¼" between the restraining bolts and the housing and spring to prevent interference with spring performance. Limit stops shall be out of contact during normal operation. Mountings shall have an adjusting bolt on the top of the spring compression plate. For non-seismic applications, neoprene acoustical non-skid pads (¼ inch minimum thickness) shall be attached to the bottom plate. When used in seismic applications, neoprene bushings shall be incorporated in the limit stop plate. Spring diameters shall be no less than 0.8 times the compressed height of the spring at rated load. Springs shall also have a minimum additional travel to solid equal to 50% of the rated deflection. Springs shall not be welded to the cups or housings.
2. Acceptable Manufacturers:
   a. Vibration Mountings and Controls, Inc.
   b. Mason Industries.
   c. Vibration Eliminator.

D. Combination Spring/Rubber Isolation Hangers:
1. Spring-Flex hangers shall consist of a steel spring in series with a 0.2 inch (minimum) deflection neoprene element. Springs shall be color coded, and elastomer element molded in specific colors for proper identification of rated load capacity. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Pipe isolators shall have spring diameters and hanger box lower hole sizes of sufficient size to permit the hanger rod to swing approximately 30° before contacting the box. Hangers which are to be used with flat iron duct straps will be provided with eye bolts on both ends.
2. Acceptable Manufacturers:

a. Vibration Mountings and Controls, Inc.
b. Mason Industries.
c. Vibration Eliminator.

E. Spring/Rubber Pre-Positioning Hangers:
1. Spring-Flex hangers shall consist of color-coded steel spring in series with a neoprene element molded in specific colors for proper identification of rated load capacity. Hanger design shall incorporate a means for supporting the suspended equipment or piping at a fixed elevation during installation regardless of load changes as well as a means for transferring the load to the spring.
2. Acceptable Manufacturers:
a. Vibration Mountings and Controls, Inc.
b. Mason Industries.
c. Vibration Eliminator.

F. Pre-Compressed Hangers:
1. Spring-Flex hangers shall consist of a color-coded steel spring in series with a neoprene element molded in specific colors for proper identification of rated load capacity. Springs shall be pre-compressed to the rated deflection so as to support the suspended equipment or piping at a fixed elevation during installation regardless of load changes. For 30° misalignment capability, spring diameters and hanger box lower hole sizes shall be of sufficient size to permit the hanger rod to swing approximately 30° before contacting the box.
2. Acceptable Manufacturers:
a. Vibration Mountings and Controls, Inc.
b. Mason Industries.
c. Vibration Eliminator.

G. Spring Hangers:
1. Spring-Flex hangers shall consist of a color-coded steel spring with a neoprene and steel washer, which will properly distribute the load on the spring. For 30° misalignment capability, spring diameters and hanger box lower hole sizes shall be of sufficient size to permit the hanger rod to swing approximately 30° before contacting the box. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Hangers, which are to be used with flat iron duct straps will be provided with eye bolts on both ends.
2. Acceptable Manufacturers:
a. Vibration Mountings and Controls, Inc.
b. Mason Industries.
c. Vibration Eliminator.

H. Self-Aligning Spring Hanger:
1. Spring-Flex hangers shall consist of a color-coded steel spring seated in a neoprene spring cup with integral bushing to insulate the lower support rod from the hanger box. The steel hanger box shall be hinged to allow for a minimum of 30° misalignment between the rod attachment to structure and the connection to the supported equipment. Hanger boxes shall withstand three times the rated load without failure.
2. Acceptable Manufacturers:
a. Vibration Mountings and Controls, Inc.
b. Mason Industries.
c. Vibration Eliminator.

I. Floor, Wall, And Ceiling Sleeves:
   1. Where piping passes through walls, floors, or ceilings, a vibration control sleeve shall be provided to reduce the transmission of vibration. The sleeve shall consist of two pipe halves with neoprene sponge material bonded to the inside and a bolting arrangement for secure fit around piping. Where temperature exceeds 240°F, an appropriate density fiberglass shall be used in place of neoprene material.
   2. Acceptable Manufacturers:
      a. Vibration Mountings and Controls, Inc.
      b. Mason Industries.
      c. Vibration Eliminator.

J. Seismic Spring Mountings:
   1. Steel spring isolator incorporating elastomeric snubbing in all directions. The snubber shall be adjustable in the vertical direction and allow a maximum of ¼" travel in all directions before contacting the elastomer cushion. Spring diameters shall be no less than 0.8 times the compressed height of the spring at rated load. Springs shall also have a minimum additional travel to solid equal to 50% of the rated deflection. Housing shall have provision to adjust the rebound plate and to inspect the spring. Housing shall be of cast ductile iron, malleable cast iron or of welded steel construction. Gray iron castings are not permitted. Springs shall be color coded for proper identification of rated load capacity. Springs shall be coated with a polyester epoxy powder. Hardware shall be stainless steel, or zinc plated.
   2. Acceptable Manufacturers:
      a. Vibration Mountings and Controls, Inc.
      b. Mason Industries.
      c. Vibration Eliminator.

K. Seismic Snubbers/Restraints:
   1. All-directional seismic snubbers shall include all directional elastomer elements, having a minimum elastomer thickness of ¾" in all directions. Elastomers shall be easy to inspect and shall consist of replaceable elastomer inserts. Elastomer shall be neoprene or a high quality rubber including anti-ozone and anti-oxidant materials and conform to ASTM D2000 Grade 2BC or Bridge Bearing Neoprene. Snubbers shall be manufactured with an air gap between steel and elastomer of 1/8 inch to ¼ inch. Snubbers shall be installed with factory set clearances.
   2. Snubber must have at least two anchor bolt holes and shall have an ultimate load capacity of at least four times the rated static load capacity.
   3. Acceptable Manufacturers:
      a. Vibration Mountings and Controls, Inc.
      b. Mason Industries.
      c. Vibration Eliminator.

L. Cable Restraints/Single Arm Brace:
   1. Steel aircraft cable restraints are designed and installed to limit motion on suspended isolated equipment, piping or ducting. Cable are installed with enough slack to engage only when ¼ inch movement occurs. On suspended equipment, cables are installed in sets of four, located at 45° angles to all three axes. Where required at pipe hangers, cables are placed two at each location, alternating orientation at successive locations. Cable shall be 7x19 galvanized or stainless steel aircraft cable conforming to FED-STD-RR-W-410D.
   2. Non-isolated equipment, pipe, and duct shall be seismically restrained with the use of a rigid brace consisting of two steel brackets designed to accept a steel angle or unistrut.

Brackets shall provide easy installation by allowing full range of motion in horizontal and vertical directions. Rigid braces with slotted holes or hinges are not acceptable.

3. Acceptable Manufacturers:
   a. Vibration Mountings and Controls, Inc.
   b. Mason Industries.
   c. Vibration Eliminator.

M. Captive Elastomer Mountings:
1. Consist of a captive elastomeric mount molded from neoprene or EPDM compound conforming to the requirements of ASTM D2000. Load bearing elastomer element shall be housed in a cast ductile iron housing. Mount shall incorporate a fail-safe captive design, and shall provide a vertical natural frequency of approximately 8 Hz at rated static load. Mount shall be capable of providing dynamic deflections of up to .5 inches.
2. Acceptable Manufacturers:
   a. Vibration Mountings and Controls, Inc.
   b. Mason Industries.
   c. Vibration Eliminator.

N. Structural Bases:
1. Integral structural steel bases shall be rectangular in shape. All structural members shall be of wide flange, angle or channel steel with depth equal to a minimum of 1/10 of the longest span of equipment, but not less than 6 inches. Built-in adjustable motor slide rails and height saving brackets shall be supplied as in integral part of the base.
2. Acceptable Manufacturers:
   a. Vibration Mountings and Controls, Inc.
   b. Mason Industries.
   c. Vibration Eliminator.

O. Structural Rails:
1. Rails for indoor applications or outdoor applications where equipment supports are mounted on isolation systems shall be of wide flange, angle or channel steel with depth equal to a minimum of 1/10 of the longest span of equipment, but not less than 6 inches. Height saving brackets shall be supplied as an integral part of the rails. For seismic applications rails must be structurally attached to one another.
2. Rails for outdoor applications where weatherproofed isolated equipment supports are required, shall be a continuous structural support rail that combines equipment support and isolation mounting into one unitized assembly. Rails shall incorporate roof-enclosed springs, which are adjustable, removable and interchangeable, after equipment has been installed. The system shall maintain the same installed and operating height with or without the equipment load and shall be capable of being utilized as a blocking device. The entire assembly shall be an integral part of the roof's membrane waterproofing. Unit to be supplied with continuous upper and lower galvanized flashing. Rails shall be cross-braced at support and equipment attachment points when used in seismic zones. Rails shall be bolted or welded to the building steel or anchored to the concrete deck to attain specified acceleration criteria.
3. Acceptable Manufacturers:
   a. Vibration Mountings and Controls, Inc.
   b. Mason Industries.
   c. Vibration Eliminator.

PART 3 - EXECUTION

3.1 GENERAL

A. All vibration isolators and seismic restraint systems must be installed in strict accordance with the manufacturer's written instructions and all certified submittal data.

B. Installation of vibration isolators and seismic restraints must not cause any change of position of equipment or conduit resulting in stresses or misalignment.

C. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.

D. The Contractor shall not install any isolated equipment, which makes rigid connections with the building unless isolation is not specified. "Building" includes, but is not limited to, slabs, beams, columns, studs and walls.

E. Coordinate work with other trades to avoid rigid contact with the building.

F. Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. General bracing may occur from flanges to structural beams, upper truss cords in bar joist construction and cast in place inserts or wedge type drill-in concrete anchors.

G. Seismic cable restraints shall be installed slightly slack to avoid short circuiting the isolated suspended equipment.

H. Seismic cable assemblies are installed taut on non-isolated systems. Seismic solid braces may be used in place of cables on rigidly attached systems except where single arm braces incorporate resilient bushings.

I. At locations, where seismic cable restraints or seismic solid braces are located, the support rods must be braced when necessary to accept compressive loads.

J. At all locations where seismic cable braces and seismic cable restraints are attached to pipe clevises, the clevis bolt must be reinforced with pipe clevis cross bolt braces or double inside nuts if required by seismic acceleration levels.

K. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted.

L. Where piping passes through walls, floors or ceilings, the Contractor shall provide wall seals or resilient packed pipe sleeves.

M. Special & Periodic Inspections for items listed in Section 1.5.B.4.b shall be conducted and submitted on a timely basis.

3.2 EQUIPMENT INSTALLATION

A. Equipment shall be isolated and restrained as follows:

1. All floor-supported equipment shall be seismically braced.
2. All ceiling suspended equipment shall be seismically braced.
3. All wall-mounted equipment shall be seismically mounted.
4. All conduit, cable tray, bus duct and wireway shall be seismically braced.

B. Place floor mounted equipment on 4" high concrete housekeeping pads properly doweled or expansion shielded to the deck to meet acceleration criteria (see Section1.5.D). Anchor isolators and/or bases to housekeeping pads. Concrete work is specified under Division 2.

C. Additional Requirements:
1. The minimum operating clearance under bases shall be 2".
2. All bases shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the equipment, isolators and restraints.
3. The equipment shall be installed on blocks to the operative height of the isolators. After the entire installation is complete, and under full operational load, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators. Remove all debris from beneath the equipment and verify that there are no short circuits of the isolation. The equipment shall be free in all directions.
4. Ceilings containing diffusers must meet seismic zone requirements by using earthquake clips or other approved means of positive attachment to secure diffuser to T-bar structure.
5. All floor or wall mounted equipment shall be restrained.

3.3 SEISMIC RESTRAINT OF PIPING, CONDUIT, BUS DUCT AND CABLE TRAY

A. All high hazard and life safety pipe regardless of size such as fuel oil piping shall be seismically restrained. Seismic cable restraints or seismic solid braces may be used. There are no exclusions for size or distance for this category.

B. Seismically restrain all conduit seismic cable restraints or seismic solid braces may be used on unisolated conduit.

C. See the below Table for maximum seismic bracing distances.

TABLE A
SEISMIC BRACING TABLE
ON CENTER SPACING

Equip	Transverse	Longitudinal	Within Each Change Of Direction (Larger of)
Conduit	40 Feet	80 Feet	10 Ft or 15 Diameters
Bus Duct	20 Feet	40 Feet	4 Feet
Cable Tray	40 Feet	80 Feet	10 Feet

D. Multiple runs of conduit on the same support shall have distance determined by calculation.

E. Rod braces shall be used for all rod lengths greater than 3'.

F. Clevis hangers shall have spacer placed inside of hanger at seismic brace locations.

G. Transverse restraint for one conduit section may also act as a longitudinal restraint for a conduit section of the same size connected perpendicular to it if the restraint is installed within 24" of the elbow or TEE or combined stresses are within allowable limits at longer distances.

H. Hold down clamps must be used to attach conduit to all trapeze members before applying restraints.

I. Branch lines may not be used to restrain main lines.

3.4 INSPECTION

A. All independent Special and Periodic Inspections must be performed and submitted on as outlined in Section 1.05.

B. Upon completion of installation of all vibration isolation devices, the local representative shall inspect the completed project and certify in writing to the Contractor that all systems are installed properly, or require correction. The Contractor shall submit a report to the Architect, including the representative's report. Certifying correctness of the installation or detailing corrective work to be done.

END OF SECTION

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, and protecting identification signs and labels for electrical systems.

B. Related Section:
   1. Section 26 05 00 - Common Work Results for Electrical.
   2. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables.
   3. Section 26 43 13 - Surge Protective Devices (SPD).
   4. Section 26 28 16.13 - Low-Voltage Enclosed Switches.
   5. Section 26 28 16.19 - Low-Voltage Enclosed Circuit Breakers.
   6. Section 26 24 13 - Switchboards
   7. Section 26 24 16 - Panelboards.

1.2 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI Z535.4, Product Safety Signs and Labels.

B. National Electrical Manufacturer's Association (NEMA):
   1. NEMA 250, Enclosures for Electrical Equipment.

C. National Fire Protection Association (NFPA):
   1. NFPA 70, National Electrical Code (NEC).
   2. NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces.

D. U. S. Government:
   1. Code of Federal Regulations (CFR)
      a. 29 CFR 1910 Occupational Safety and Health Standards.

1.3 DEFINITIONS

A. Mimic bus refers to a graphical representation of the devices and bus work within an item of electric equipment.

1.4 SUBMITTALS

A. Submit the following information for approval in accordance with the requirements of Section 01 33 00 and Section 26 05 00:
   1. Product Data:

a. Provide catalog cuts for the actual products provided, and indicate clearly the usage of each product.

2. Shop Drawings:
   a. Provide a schedule depicting all nametag legends.
   b. Provide drawings of typical nametags.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with the all applicable requirements of OSHA, but particularly those stated in 29 CFR 1910.144 and 29 CFR 1910.145.
   2. Comply with the requirements of NFPA 70E that are applicable to electrical identification items as listed below in this Specification Section.

1.6 DELIVERY, STORAGE AND HANDLING

A. Protect items from damage during delivery, storage, and handling in accordance with Section 26 05 00 and as detailed below.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide products meeting the specified requirements from one of the following manufacturers, unless otherwise indicated:
   1. Brady Worldwide, Inc., P. O. Box 2131, Milwaukee, WI 53201-2131, Telephone (414) 358-6600.
   2. Seton Identification Products, 20 Thompson Road, P. O. Box 819, Branford, CT 06405-0819, Telephone (800) 243-6624..
   3. LEM Products, Inc.; P. O. Box 190, 4089 Landisville Road, Doylestown, PA 18901, Telephone (800) 220-2400 or (215) 348-9900.

B. To serve as examples of the quality required of the specified products, several Brady Worldwide, Inc. Product Numbers are listed for informational purposes only.

2.2 MATERIALS

A. Laminated Phenolic or Plastic:
   1. Provide rigid, thermosetting resin or polymer material that is heat- and fire- resistant, abrasion resistant, electronically non-conductive, and non-corroding.
   2. Extrude the thermosetting resin or polymer into sheets, and laminate the sheets together so that colored top and bottom layers sandwich a contrasting color core in the middle.

B. Mounting Hardware:
   1. Provide number 10 hex-head machine screws and lock-washers, or hex-head bolts, lock-washers, and nuts for mounting identification nameplates onto electrical equipment.

2. Provide either type 316 stainless steel or brass fasteners; however, all fasteners used on the same nameplate must be of the same material.

2.3 EQUIPMENT IDENTIFICATION NAMEPLATES

A. Provide laminated phenolic or plastic equipment identification nameplates having beveled edges and engraved lettering.
   1. Drill holes for mounting hardware in the equipment identification nameplates as follows:
      a. For nameplates that are more than 2 inches wide, drill four holes.
      b. For nameplates that are more than 1-1/2 inches high, drill four mounting holes.
      c. For smaller nameplates, drill holes for two fasteners.
   2. Provide equipment identification nameplates long enough to ensure that the heads of fastening hardware do not extend beyond the nameplate material, and come no closer than 1/16-inch to the nearest letter of the nameplate legend and no closer than 1/16-inch to the nearest edge.

B. Engrave the following information on each equipment identification nameplate, similar to that shown in Examples 1 and 2 below except appropriate for the specific equipment being identified:
   1. In the first line, indicate the equipment type and identification number.
   2. In the second line, indicate the equipment Voltage, the equipment current if known, the phase, and the number of wires.
      a. If the current is listed, provide a description that further identifies the current, such as “overload protection current”, full load amps (FLA), or other information identifying the current indicated.
   3. In the third line, indicate the words “SERVED FROM” followed by the serving equipment and the branch circuit.
      a. If multiple sources serve the equipment, list all sources on succeeding lines.

EXAMPLE 1:

POWER PANELBOARD PPB-2
208/120 VOLTS, 10.8 FLA, 3-PHASE, 4-WIRE
SERVED FROM
PPB-1, CIRCUITS F1 THROUGH T1

      b. If the equipment is supplied through automatic transfer switches and transformers or other items without disconnects, include data on all upstream disconnects; and beneath the sources add the word “THROUGH” followed by the name of the equipment that the sources are connected through.

EXAMPLE 2:

POWER PANELBOARD PPB-2
480/277 VOLTS, 3-PHASE, 4-WIRE
SERVED FROM
BOTH EGS-2 AND MCC-1
THROUGH ATS-1

4. For motor starters, circuit breakers, transformers, and disconnect switches, provide an additional line with the word “SERVES” and the equipment served.

C. Engrave the following information on identification plate for any distribution equipment (i.e. switchboard, panelboard, motor control center, switchgear, etc.).
1. The conductor insulation color coding for feeder and branch circuit wiring originating from each piece of distribution equipment per NFPA 70. Refer to Specification Section 26 05 19 for wire and cable color coding requirements.

EXAMPLE for 208Y/120 volt equipment:

PHASE	COLOR
A	BLACK
B C	RED
GROUNDED CONDUCTOR	BLUE
(NEUTRAL) EQUIPMENT GROUNDING	WHITE
CONDUCTOR	GREEN

D. Engrave equipment identification nameplates with all capital, Helvetica Medium font, or equal, lettering.
1. Provide white letters on a black background, except for warning nameplates provide white lettering centered on red backgrounds.
2. Provide a minimum 1/8-inch border between the nameplate lettering and the tops and bottoms of the nameplates.
3. Use 3/8-inch high letters for the first line, and 1/4-inch letters for succeeding lines; except, in cases where the tag will not fit because the equipment is too small, use 3/16-inch letters for the first line and 1/8-inch letters for succeeding lines.

2.4 CONDUIT AND RACEWAY LABELS

A. Conduit Voltage Markers:
1. Provide conduit markers consisting of polymer-coated cloth tape with a printable top coat and a rubber based pressure sensitive adhesive on the back to provide oil and water resistance, good print durability, and the flexibility to allow it to be wrapped around curved surfaces.
2. Clearly mark the voltages in black lettering on orange colored tape backgrounds.

B. Conduit Wiring System Identification:
1. Provide companion type labeling markers to indicate the wiring system in each raceway and consisting of a vinyl film substrate with a pressure sensitive acrylic adhesive backing.
2. Clearly mark the wiring systems in black lettering on orange colored tape backgrounds.
3. To properly identify each electrical system in the raceway, provide the following, or similar, wording on the labeling markers corresponding to the systems:
   a. For electrical power systems, word the labels "POWER".
   b. For control systems, word the labels "CONTROL".
   c. For instrumentation systems, word the labels "INSTR."
   d. For telephone systems, word the labels "TELEPHONE"

e. For supervisory control and data acquisition systems, word the labels "SCADA",
f. For local area networks, word the labels "LAN".

C. Conduit Feeder Identification:
1. Provide conduit feeder identification markers consisting of polymer-coated cloth tape with a printable top coat and a rubber based pressure sensitive adhesive on the back to provide oil and water resistance, good print durability, and the flexibility to allow it to be wrapped around curved surfaces.
2. Provide conduit feeder identification labels that identify the feeder circuit with 3/4- inch high black lettering on yellow backgrounds.

D. Conduit and Raceway Label Dimensions:
1. Provide label color field lengths and lettering height as indicated in Table 26 05 53-1:

Table 26 05 53 -1 Conduit and Raceway Label Sizes

Raceway Outside Diameter (Inches)	Background Length (Inches)	Lettering Height (Inches)
3/4 to 2	7	1
1-1/2 to 2	7	1
2-1/2 to 6	14	1-1/4

E. Product Examples:
1. Conduit Voltage Markers: Brady Worldwide, Inc., B-946 custom self-sticking pipe markers or color code tape.
2. Conduit Wiring System: Brady Worldwide, Inc., B-946 custom self-sticking pipe markers or color code tape.
3. Conduit Feeder Identification: Brady Worldwide, Inc., Product Number 31964.

2.5 ARC-FLASH WARNING LABELS

A. Arc Flash Warning Labels shall be prepared in accordance with NFPA 70, NFPA 70E, IEEE-1584 latest editions and ANSI Z535.
1. Minimum label size shall be 4" x 6" as provided by Duralabel or Brady with applicable header information identifying both warning and danger based upon the findings.
2. Minimum information to be included on the Arc Flash label shall consist of the following:
a. Prefaced electrical warning including universal symbol identification, approved safety color, and preface description noting that arc and shock hazard are present. Note where dual labeling is provided/required with the use of arc flash reduction maintenance settings within the equipment, such labels shall be uniquely identified by a different label safety color l, as approved by the Owner. Consult the Owner for acceptable color schemes to be used for the equipment.
b. Statement noting that personnel protective equipment (PPE) requirements are required. Clearly identify all equipment as “Dangerous” where work on energized equipment is otherwise prohibited and/or where no safe PPE protection so exists.
c. Calculated arc flash hazard boundary, in inches.
d. Calculated arc flash hazard at 18 inches, in calories/cm^2.
e. Arc flash hazard risk category, including descriptive summary of required PPE items necessary for entry into energized equipment.

f. Voltage classification and description of conditions present for shock hazard.
g. Insulated glove classification rating, as required for contact conditions and measurements.
h. Limited approach boundary, in inches.
i. Restricted approach boundary, in inches.
j. Prohibited approach boundary, in inches.
k. Available short circuit current
l. Unique equipment locator identification, corresponding to applicable one-line diagram and ESOD as specified in Section 26 05 00 device abbreviation identifiers.
m. Name, address & phone number of the responsible engineer, engineering company or agency contracted to perform the analysis. Also include the preparer's name, where prepared by a subcontract to the named company or agency contracted to perform the analysis report.
n. Respective contract (job) number for the analysis report.
o. Preparation date of the issued/approved Arc Flash Study (analysis) supporting the equipment labeling, as installed.
p. Suffix cautionary warning that "Changes in equipment settings or system configuration will invalidate the calculated values and PPE requirements."

2.6 DANGER WARNING LABELS:

A. Provide danger signage in accordance with the requirements of 29 CFR 1910.145 and NFPA 70E.
1. For enclosures, provide signs with the caption "DANGER HIGH VOLTAGE KEEP OUT"
2. For fences, provide signs similar to the signs for enclosures, except provide dual language sign captions in both Spanish and English and add Mister Ouch symbols.
3. For poles, provide dual language signs similar to the signs for fences, except add the words "KEEP OFF".

B. Product Examples:
1. Enclosure danger signs: Brady Worldwide, Inc. Product Number 84083.
2. Fence Danger signs: Brady Worldwide, Inc. Product Number 69737.
3. Pole danger signs: Brady Worldwide, Inc. Custom markers.

2.7 MULTIPLE SERVICES WARNING LABELS:

A. Provide a nameplate with black letters on a red background that indicates equipment is fed by two or more sources.

2.8 MIMIC BUS:

A. Provide plastic mimic buses in accordance with the electrical equipment manufacturer's standard practice for the respective equipment.
1. Provide a plastic or plastic tape mimic that is resistive to acids, alkalis, alcohol, chemicals, water, and weathering; and that does not come off after application without the use of a process designed specifically for the purpose.

a. If using plastic tape, provide a type that has a selective sheathing, cloth backing, and a pressure sensitive adhesive with paper backing, similar to Scotchlite Marking Film manufactured by 3M United States.

2. To indicate the various items of electrical equipment, use symbols that are similar to those used in an electrical one-line diagram.
3. Use the following standard colors for the buses indicated:
   a. For normal bus: Blue.
   b. For emergency bus: Red.
   c. For neutral bus: Yellow.
   d. For ground bus: Green.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prior to installing electrical identification items, verify with Metro North Railroad that the data on each is correct.

3.2 INSTALLATION

A. Wiring Identification:
   1. Identify wiring in conformance with the requirements of Section 26 05 19.

B. Conduit and Raceway Identification:
   1. Identify the wiring systems in conduit and raceway by providing companion type labeling markers to indicate the systems in each.
   2. Identify the Voltages carried in conduit and raceway by providing voltage labeling markers on all accessible raceways.
   3. Identify feeders by providing identification labels.

C. Electrical Box Identification:
   1. For each pull box and junction box, if it is not otherwise indicated, install a laminated phenolic identification nameplate with 1/8-inch letters on a black background above or next to the box identifying its source of power; for example, indicate the panelboard and circuit number supplying power to a box with an identification nameplate.
   2. For each device and outlet box used as a branch circuit junction or pull box provide a legible hand written panel designation and circuit number on exterior of box cover. Utilize a permanent black marker.
   3. For above ground pull boxes and junction boxes, install nameplates adjacent to or above the item in a visible location.
      a. For NEMA 1 and 12 enclosures constructed as specified in NEMA 250, fasten the nameplate to the enclosure using 316 stainless steel screws or an approved equal.
      b. For other than NEMA 1 and 12 enclosures, fasten the nameplate to the enclosure using Seton number15660 adhesive or an approved equal.
   4. For in-ground pull boxes and junction boxes, install nameplates adjacent to or above the item in a visible location and inside the box immediately below the cover.
      a. For NEMA 1 and 12 enclosures constructed as specified in NEMA 250, fasten the nameplate to the enclosure using 316 stainless steel screws or an approved equal.

b. For other than NEMA 1 and 12 enclosures, fasten the nameplate to the enclosure using Seton number15660 adhesive or an approved equal.

D. Wiring Device Faceplate Labeling:
1. Outside of faceplate:
a. On receptacle faceplates, provide a label indicating panel designation and circuit number. Utilize a thermal label maker device with clear label tape, font color shall be black and type shall be Arial.
2. Inside of faceplate:
a. On receptacle and lighting control device faceplates, provide a legible hand written panel designation and circuit number tag. Utilize a permanent black marker.

E. Electrical Equipment Identification:
1. Provide identification nameplates and an approved mimic bus on the front of the following electrical equipment:
a. Surge Protective Devices (SPD), as specified in Section 26 43 13.
b. Enclosed circuit breakers as specified in Section 26 28 16.19.
c. Low-voltage enclosed switches as specified in Section 26 28 16.13.
d. Switchboards as specified in Section 26 23 13.
e. Panelboards as specified in Section 26 24 16.
2. Install nameplates in the top center of the front face of the electrical equipment in a visible location.
a. For NEMA 1 and NEMA 12 enclosures constructed as specified in NEMA 250, fasten the nameplate to the enclosure using 316 stainless steel screws or an approved equal.
b. For other than NEMA 1 and 12 enclosures, fasten the nameplate to the enclosure using Seton number15660 adhesive or an approved equal.
3. Provide a manufacturer installed mimic bus; field installed mimic buses are not acceptable.

F. Arc-Flash Warning Signage:
1. For each arc location or circuit analyzed as part of the Arc Flash Study in Section 26 05 00, provide Arc Flash Warning labels.

G. High Voltage Warning Signage:
1. Install high voltage warning signage on all personnel entry points to electrical rooms or fenced electrical areas, and on all equipment enclosures within those spaces.
a. Install high voltage warning signage on all fence gates and every 10 feet on the perimeter fence around electrical areas.
b. Install high voltage warning signage on both sides of all electrical poles.

H. Multiple Services Warning Signage:
1. Within existing switchgear and on the tie circuit-breaker compartment of new switchgear and transfer devices, mark each panelboard with a nameplate indicating that this equipment is fed by two sources.

END OF SECTION

SECTION 26 05 63 - ACCEPTANCE TESTING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: The work specified in this Section consists of materials to performance test electrical systems and equipment.
   1. Items Supplied Under This Section:
      a. Electrical System Testing
      b. Thermographic Testing
      c. Ground System Testing
      d. Insulation Testing
      e. Equipment Testing
      f. Performance Test
      g. Test Procedure
      h. Test Report

B. Related Sections:
   1. Division 1 – General Requirements
   2. Division 26 Sections, As Applicable

1.2 REFERENCES

A. Applicable Documents and Testing Requirements of:
   1. America National Standards Institute (ANSI): as applicable, including:
      a. ANSI C2, National Electrical Safety Code.
      b. ANSI Z244.1 American National Standards for Personnel Protection.
   2. National Electrical Manufacturer's Association (NEMA): as applicable, including:
      a. NEMA ICS 2.3 - Instructions for the Handling, Installation, Operation and Maintenance of Motor Control Centers.
      b. NEMA ICS 7.1 - Safety Standards for Construction and Guide for selection, Installation, and Operation of Adjustable Speed Drive Systems.
      c. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
      d. NEMA PB 2.1 - Proper Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.
   3. American Society for Testing and Materials (ASTM), as applicable.
   4. Institute of Electrical and Electronics Engineers (IEEE), as applicable, including:
      a. IEEE C.57.13, IEEE Standard Requirements for Instrument Transformers.
   5. National Fire Protection Association (NFPA), as applicable, including:
      a. NFPA 70 - National Electrical Code (NEC).
      b. NFPA 70E - Electrical Safety Requirements for Employee Workplaces.
      c. NFPA 72 - National Fire Alarm Code (NFAC).
   6. International Electrical Testing Association (IETA) as applicable, including:
      a. Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems.

7. Insulated Cable Engineer's Association (ICEA), as applicable.
8. State and Local Codes and Ordinances as applicable
9. Occupational Safety and Health Administration (OSHA), as applicable, including: Title 29, Parts 1907, 1910 and 1936.
10. International Electrical Testing Association (IETA) as applicable, including:
    a. ATS-2009: Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems.
    b. MTS-2007: Maintenance Testing Specifications for Electric Power Distribution Equipment and Systems.

1.3 SUBMITTALS

A. Submit documentation as required by this Section of the Contract to Metro North Railroad in strict accordance with the provisions of Section 26 05 00 for review, comments and subsequent approval.

B. Submission to include the following:
1. Field inspection report as required for each item of material and/or equipment outlined herein.
2. Manufacturer's directions for use of ground megger with proposed method indicated.

C. Test Reports:
1. Each test report prepared by the respective testing firm(s) comply, where applicable, to all stipulations specified in Section 26 05 00 for Operation, Maintenance and Installation Manuals with reference to preparation, paper requirements, indexing and binders. Include in each test report the following:
    a. Summary of project.
    b. Description of equipment tested.
    c. Description of test.
    d. Test results.
    e. Conclusions and recommendations.
    f. Appendix, including appropriate test forms.
    g. Identification of test equipment used.
    h. Signature of responsible test organization authority.
    i. Furnish five copies of each completed report to Metro North Railroad no later than 30 days after completion of each test. Assemble and certify the testing firm each final test report, which must be submitted to Metro North Railroad for review, comments and subsequent approval.

1.4 QUALITY ASSURANCE

A. Qualifications of Testing Laboratory: Select an independent nationally recognized testing laboratory that is independent from electrical Contractor that either is a member of The International Electrical Testing Association or meets the following qualifications:
1. Is nationally recognized as an electrical testing laboratory.
2. Has been regularly engaged in the testing of electrical systems and equipment for at least 5 years.
3. Is independent from the electrical Contractor, Metro North Railroad and all other Contractors on the job.

4. Has at least one Professional Engineer on staff that is licensed in the State where the project site is located.
5. Derives more than 80 percent of its income from electrical testing.
6. Owns or leases sufficient calibrated equipment to do the testing required.
7. Has a means to trace all test instrument calibration to The National Institute of Standards and Technology.

B. Membership in the International Electrical Testing Association (NETA) shall be considered evidence of meeting items A. 1. through and including A. 5.

C. Testing shall be done under the supervision of a technician certified by International Electrical Testing Association or by technicians that are both certified by the National Society of Professional Engineers and experienced in electrical testing with 5 years of testing experience.

D. The testing laboratory shall supervise or perform all testing of equipment and oversee setting of all circuit breakers and calibration of all instruments.

E. The testing firm used must be approved by Metro North Railroad.

F. Include the cost of such tests in the Contractors Bid Price for the applicable bid item.

1.5 GENERAL REQUIREMENTS

A. Field Inspection:
1. This Contractor is responsible for a complete inspection of all equipment, prior to testing and energizing to ascertain that it is free from any damage, scratches, or missing components and that all power connections are correct, and that they are tight in conformance with recommended standard practice. The inspection is to also include a check of control wiring, terminal connections and all bolts and nuts.
2. Perform field inspection by this Contractor during a time when a Metro North Railroad representative is present to witness each inspection and its performance.
3. Correct any deficiencies found during the inspection by this Contractor prior to the energizing and testing of the equipment.

1.6 SCHEDULING

A. Schedule all testing with work of other Contractors to ensure an orderly sequence of startup and completion of work.

1.7 UNDERGROUND CONDUIT SYSTEM INSPECTION

A. General Requirements: Perform inspection of the underground conduit systems installation by a representative of Metro North Railroad as the work progresses. Inspect each of the following prior to proceeding to the next phase of the installation.
1. Trench bed.
2. Lower sand bed.
3. Lower concrete protection slab, where indicated or required.
4. Upper sand bed for conduits.

5. Each layer of conduits.
6. Soil backfill.
7. Warning Tape.
8. Soil backfill.

B. Failure to comply with any of the above, indicated sequential inspection requirements is just cause for Metro North Railroad to request removal of the work and reinstall as per these specifications.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 ELECTRICAL INSPECTIONS AND TESTS

A. Perform, supervise, and furnish all test equipment needed to perform tests and provide safety measures, procedures and equipment required for each test.

B. Schedule all testing with Metro North Railroad. Perform testing in the presence of Metro North Railroad except when Metro North Railroad approves in writing conducting a specific test without Metro North Railroad's presence.

C. Notify all involved parties including the Engineer prior to tests, advising them of the test to be performed and the scheduled date and time.

D. Coordinate the tests with others involved.

E. Prepare written test procedures and forms used in the test reports and submit for approval prior to commencement of testing.

F. Include in each test report the following information:
1. Job title.
2. Date of test.
3. Equipment, system or cable identification.
4. Type of test.
5. Description of test instrument and date of latest calibration.
6. Section of specification defining test along with description of test and evaluations as reported by the testing company.
7. Test results (correct all readings at 20 degrees C).
8. Signature of person supervising test.
9. Signature of Contractor.
10. Space for Metro North Railroad representative's signature.

G. Refer to individual tests and inspections hereinafter specified for any additional or specified requirements.

H. Test Instrument Calibration:

1. The testing firm is to have a calibration program, which assures that all applicable test instrumentation are maintained within rated accuracy.
2. The accuracy is to be directly traceable to The National Institute of Standards and Technology.
3. Instruments are to be calibrated in accordance with the following frequency schedule.
   a. Field Instruments: Analog - 6 months maximum Digital - 12 months maximum
   b. Laboratory Instruments: 12 months
   c. Leased specialty equipment: 12 months
4. Make dated calibration labels visible on all test equipment.
5. Keep records up-to-date, which show date and results of instruments calibrated or tested.
6. Maintain an up-to-date instrument calibration instruction and procedure for each test instrument.
7. Calibrating standard is to be of higher accuracy than that of the instrument tested.

I. Safety and Precautions:
1. Safety practices are to include, but are not limited to, the following requirements:
   a. Occupational Safety and Health Act of 1970-OSHA.
   b. Accident Prevention Manual for Industrial Operations, National Safety Council, Chapter 4.
   c. Applicable State and Local safety operating procedures.
   d. IETA Safety/Accident Prevention Program.
   e. Owner's safety practices.
   f. National Fire Protection Association - NFPA 70E.
   g. ANSI Z244.1 American National Standards for Personnel Protection.
2. Perform all tests with apparatus de-energized except where otherwise specifically required.
3. The testing firm is to have a designated safety representative on the project to supervise operations with respect to safety.

3.2 TESTING TO BE PERFORMED BY THE CONTRACTOR

A. Continuity Test: Make test for continuity and correctness of wiring and identification on all conductors installed.

B. Wire and Cable:
1. Test all wires and cables sized No. 2 and larger in accordance with NETA ATS- 2009.
2. Perform visual, mechanical, and electrical tests on all No. 4 and No. 6 power cables that operate at voltages exceeding 150 volts to ground in accordance with NETA ATS-2009.
3. Perform visual, mechanical, and electrical tests on all other wires and cables in accordance with NETA ATS-2009.
4. Replace any wires which have been damaged.
5. Correct causes of all readings which do not meet the acceptable minimum insulation readings are as stated in NETA ATS-2009. Exceed the nominal expected temperatures for the actual load.
6. Retest items requiring correction.

C. Surge Protective Device (SPD):
1. Visually and mechanically inspect the SPD unit and connections.

2. Use an AC voltmeter to check all voltages and ensure that normal operating voltages of the power system match the voltage rating on the SPD nameplate.
3. Check LED status indicators on the display panels and suppression modules to confirm normal status.
4. Press the alarm test button to confirm the audible alarm and LED.
5. Operate the alarm silence switch to confirm proper operation.

D. Ground Fault Circuit Interrupter (GFCI) Receptacles:
1. Test all GFCI receptacles as specified in Section 26 27 26.

E. Initial Mechanical Performance Test
1. Provide on-site electricians and support to the general Contractor during the mechanical performance test.
2. With the personnel of Metro North Railroad observing, demonstrate to the satisfaction of Metro North Railroad the mechanical performance of each item of equipment when operated in accordance with the design intent indicated by the Drawings and described in the applicable sections of the Specifications.
3. Correct all deficiencies and demonstrate that they have been corrected.
4. Without reliance on Metro North Railroad's personnel, operate and maintain the equipment in continuous, day to day, 24 hour operation until commencement of the Final Mechanical Performance Test.
5. During this interim, instruct and train the Owner's personnel in their duties.
6. Final Mechanical Performance Test: During a 48-hour period.
   a. With equipment in continuous normal operation, under supervision turn operation of the plant over to the personnel of Metro North Railroad beginning with the final tests.
   b. Demonstrate that equipment is coordinated and that installation complies with the applicable Drawings and Specifications.
   c. Measure all major feeders, the total power, total power factor, current on all lines, and voltage, phase and phase to ground, and on all phases.
   d. Measure all motors over 5 horsepower, power, power factor and voltage under load.
   e. Correct all deficiencies and demonstrate that they have been corrected.
   f. Metro North Railroad will pay operating costs for the Final Mechanical Performance Tests.
   g. Test will be considered complete after a continuous 48-hours of satisfactory operation without any failure of equipment.

F. Test Interim:
1. Contractor's Personnel, without reliance of Metro North Railroad's Personnel, are to operate and maintain the equipment in continuous, day to day, 24 hour operation except as otherwise approved by Metro North Railroad until commencement of the Final Mechanical Performance Test.
2. During this interim the Contractor's Personnel are to instruct and train Metro North Railroad's Personnel in their duties.

G. Final Mechanical Performance Test: Final Mechanical Performance Test is to cover a 48 hour period while the plant is in continuous, normal operation.
1. With equipment in continuous, normal operation, the Personnel of Metro North Railroad are to assume day to day operation of the equipment under the direct supervision of the Contractor's Personnel beginning with the Final Tests.

2. Contractor's Personnel are to demonstrate to the satisfaction of Metro North Railroad that equipment is coordinated and that installation complies with the applicable Drawings and Specifications.
3. Performance Tests are to be considered concluded at the end of the forty-eight hour period designated for the tests if Metro North Railroad is satisfied with the test results or should deficiencies be found as a result of said test, then when the deficiencies have been corrected to the satisfaction of Metro North Railroad.

H. Operating Costs: Costs for Final Mechanical Performance Tests: Metro North Railroad will pay operating costs for the Final Mechanical Performance Tests except those costs for chemicals required to complete Process Performance Tests and Acceptance Tests, if required on equipment.

3.3 TESTING TO BE PERFORMED BY THE TESTING LABORATORY

A. Select, hire and pay an independent nationally recognized electrical testing laboratory to perform all testing specified in this article. Obtain Metro North Railroad's approval of the testing laboratory and the testing laboratory proposed test procedure prior to commencement of any tests.

B. Set all adjustments for all overcurrent protection devices in accordance with the protection and coordination study of Section 26 05 00.

C. Visually and mechanically inspect and electrically test items as scheduled in attached schedule for equipment in attached schedule equipment as listed in attached schedule in using the procedures of NETA ATS-2009. When a test for a particular item is not called out in ATS, test using the procedures in NETA MTS-2007.

D. Thermographic Inspection:
1. Perform thermographic inspection of the electrical equipment and installations as listed below in accordance with NETA ATS-2009, and as detailed below. The following equipment is to be scanned:

a.	Switchboards	all ratings
b.	Switchgear	all ratings
c.	Service Entrance Panelboards	all ratings
d.	Distribution Panelboards	50-Ampere and larger
e.	Lighting Panelboards	50-Ampere and larger
f.	Power Panelboards	50-Ampere and larger
g.	Individually Mounted Circuit Breakers	100 amp and larger
h.	Disconnect Switches	100 amp and larger
i.	Individually Mounted Motor Starters	Size 1 and larger
j.	Motors	30 HP and larger

2. Provide report including the following items:
   a. Items scanned
   b. Whether item passed or failed
   c. All items in NETA ATS-2009
   d. The probable cause
   e. Severity of defect
   f. Recommended corrective measures
   g. Video recording of test.

3. Scan using an infrared camera with video scanner output to a display screen with a range of at least 1 degree C to 75 degrees C with an accuracy of 0.1 degree C and with the following equipment:
   a. One 7 degree telephoto lens
   b. One 20 degree wide angle lens
   c. One 40 degree extra-wide angle lens
4. Record output of camera during testing onto a DVD or store digital images of each piece of equipment inspected onto a CD as a record of the temperature variations. Record either by order or by digital imprinting the actual equipment being scanned. Turn off recordings during inactive periods or edit DVD to eliminate dead periods.
5. Display data on a monitor capable of providing both a gray step mode and color monitor. These capabilities allow distinct temperature levels to be shown in black and white and color on the thermogram.
6. Submit three copies of report and two copies of the DVD or CD.
7. Include DVD or CD of thermographs of the defective equipment and installations. Also include in report.
8. Submit both copies of the report to Metro North Railroad who will make the determination of corrective measurements.

E. Lighting Tests
1. Emergency, standby, equipment and lighting test-trip all incoming utility power and ascertain that all standby and emergency equipment operates. Additionally, measure lighting levels on all egress paths, at each stair landing at middle of stairs, at changes in direction at doorways and every 25' along path. Replace and correct defective equipment. However, report lighting levels to Metro North Railroad. Correction of low lighting levels will be by change order as needed. Operate battery systems for emergency lighting without power for 90 minutes and correct all defects and retest.

F. Low Voltage Molded Case Circuit Breaker Tests:
1. Visually and mechanically inspect and electrically test all low voltage circuit breakers in frame sizes rated 100-amperes or more in accordance with NETA ATS-2009.
2. Acceptable values are as stated in NETA ATS-2009.

G. Instrument Transformer Tests:
1. Visually and mechanically inspect and electrically test all instrument transformers in accordance with NETA ATS-2009.
2. Acceptable values are as stated in NETA ATS-2009.

H. Metering Tests:
1. Visually and mechanically inspect and electrically test all meters using standards traceable to The National Institute of Standards and Technology in accordance with NETA ATS-2009.
2. Meters should be accurate to within their stated calibration.

I. Grounding Electrode System Tests:
1. Visually and mechanically inspect and electrically test all made grounding electrode systems in accordance with NETA ATS-2009. For the point-to-point tests of NETA ATS-2009, measurements are only required for equipment conductors run with services, and feeders and branch circuits rated over 400 amperes.
2. Determine acceptable values as follows:
   a. Main service entrance ground: 5 ohms.

b. Panelboards ground bus: 10 ohms.
c. Manhole ground rod electrodes: 25 ohms
d. Prior to the electric service being energized and prior to the installed products being covered, measure the ground system resistance to earth in the presence of Metro North Railroad.
e. Grounds not otherwise covered in this Specification with a maximum of 25 ohms.
f. For continuity tests, determine the acceptable value for the equipment grounding conductor by the following formula:

$$R_{EquipGndCond} \leq 0.1x \frac{V_{LineToGnd}}{I_{OverCurrentProtection}}$$

Where the following definitions apply:

$R_{equipGndCond}$ = The measured resistance of the Equipment Grounding Conductor.

$V_{linetoGnd}$= The Nominal Line to Ground Voltage of the circuit or feeder.

$I_{overcurrentprotection}$ = The Trip, or Melting Current of the overcurrent protective device for the circuit.

J. Low Voltage Switchboard Tests:
1. Visually and mechanically inspect and electrically test all low voltage switchboards in accordance with NETA ATS-2009.
2. Acceptable values are as stated in NETA ATS-2009.
3. Test all components as specified in this Section.

K. Ground Fault Protection Testing:
1. Visually and mechanically inspect and electrically test all ground fault protection systems in accordance with NETA ATS-2009.
2. Acceptable test values are as stated in NETA ATS-2009.

L. AC Motor Testing:
1. Visually and mechanically inspect and electrically test all AC motors rated 10-horsepower or more in accordance with NETA ATS-2009.
2. Acceptable test values are as stated in NETA ATS-2009.
3. Immediately report all motors, which fail inspection to Metro North Railroad for correction.

M. Low Voltage Motor Starter Tests:
1. Visually and mechanically inspect and electrically test all low voltage motor starters rated 10-horsepower or more in accordance with NETA ATS-2009.
2. Acceptable values are as stated in NETA ATS-2009.

N. Voltage Adjustment:
1. Measure the plant voltage with the plant operated at both no load and at nominal load at the following locations.
a. Main Distribution Switchboard.
b. Each panelboard bus.

2. Adjust all transformer taps to bring the no-load voltage above nominal, but in no case, higher than 105.8% of nominal. Adjust the operated loaded voltage to a value above 91.7%, (ANSI Range A), with only momentary excursions to a maximum of 105.8% and a minimum of 88.3% for all loads and 86.7% for motor loads. (ANSI Range B).
3. After all adjustments have been made, re-measure all voltages.
4. For record purposes measure and record on all 3-phases, actual plant load at all switchboard and panelboard buses.
5. With a minimum/maximum recording voltmeter measure starting voltage dip for the largest motor at:
    a. Starter terminals.
    b. Panelboard.
    c. Main Distribution Switchboard.
6. Measure minimum/maximum/average voltage at Main Distribution Switchboard over a 24 hour period with the plant running on at least one phase with recording voltmeter.

O. Harmonic Testing
1. Conduct harmonic testing at:
    a. Main Distribution Switchboard.
    b. Points of Common Coupling (PCC). PCC defined as nearest switchboard or panelboard which directly serves each variable frequency drive.
    c. Generator terminals.
    d. Transformer primary terminals.
2. Measure and record the following data at each location where harmonic testing is required:
    a. Current Distortion: Total harmonic distortion (THD) and individual harmonic components up to and including the 35th harmonic.
    b. Voltage Distortion: Total harmonic distortion (THD) and individual harmonic components up to and including the 35th harmonic.
    c. Voltage Notching: Notch area (volt-microseconds) and depth (volts).
    d. For record purposes measure and record on all 3-phases, actual plant load at all switchboard and panelboard buses.
3. Conduct harmonic testing with harmonic producing loads in operation. Record the following information for variable frequency drives, taken at the time harmonic distortion measurements are made:
    a. Output frequency.
    b. Output current.
    c. Output voltage.
    d. Output power factor when motor metering includes this capability.
4. Conduct harmonic testing with variable frequency drives operating at full load and half load.
5. Test report shall include the following calculated values at each location where harmonic testing is required:
    a. Total demand distortion (TDD).
    b. Individual harmonic current distortion in percent of the maximum demand load current up to and including the 35th harmonic.

3.4 CORRECTION OF DEFICIENCIES

A. Report all unacceptable values immediately. Correct all deficiencies found in work of this contract and separately report deficiencies in work of items of other contracts.
   1. Retest items requiring correction. Correct or have corrected any remaining deficiencies and retest until work is acceptable.

3.5 RETESTING

A. After equipment has been in service for a period of nine months repeat the following tests:
   1. Thermographic testing. Correct all causes of readings above the nominal expected reading for the load encountered.
   2. Insulation tests of all switchgear and switchboards.

END OF SECTION

SECTION 26 24 13 - SWITCHBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Surge protection devices.
3. Disconnecting and overcurrent protective devices.
4. Instrumentation.
5. Control power.
6. Accessory components and features.
7. Identification.

1.2 ACTION SUBMITTALS

A. Product Data: For each switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Detail utility company's metering provisions with indication of approval by utility company.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
9. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Delegated Design Submittal:

1. For arc-flash hazard analysis.
2. For arc-flash labels.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Seismic Qualification Data: Certificates, for switchboards, overcurrent protective devices, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.4 Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.

B. Testing Agency Qualifications: Member company of NETA or an NRTL.

1.7 FIELD CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:

1. Do not deliver or install switchboards until concrete base is complete.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

a. Ambient Temperature: Not exceeding 104 deg F.

b. Altitude: Not exceeding 6600 feet.

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than two weeks in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Metro North Railroad's written permission.
4. Comply with NFPA 70E.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace switchboard enclosures, buswork, overcurrent protective devices, accessories, and factory installed interconnection wiring that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

B. Manufacturer's Warranty: Manufacturer's agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.
2. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.2 SWITCHBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton
2. General Electric Company
3. Siemens Industry, Inc.
4. Square-D by Schneider Electric

B. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Comply with NEMA PB 2.

E. Comply with NFPA 70.

F. Comply with UL 891.

G. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Fixed, individually mounted.
2. Sections front and rear aligned.

H. Nominal System Voltage: 208Y/120 V.

I. Main-Bus Continuous: Ampere rating as indicated on Contract drawings.

J. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation. Shake-table testing shall comply with ICC-ES AC156.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

K. Outdoor Enclosures: Stainless Steel, NEMA 250, Type 4X.

L. Space Heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.

1. Space-Heater Control: Thermostats to maintain temperature of each section above expected dew point.
2. Space-Heater Power Source: Transformer, factory installed in switchboard.

M. Service Entrance Rating: Switchboards intended for use as service entrance equipment shall contain from one to six service disconnecting means with overcurrent protection, a neutral bus with disconnecting link, a grounding electrode conductor terminal, and a main bonding jumper.

N. Utility Metering Compartment: Barrier compartment and section complying with utility company's requirements; hinged sealable door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.

O. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

P. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

Q. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from the front of the switchboard.

2. Phase- and Neutral-Bus Material: Tin-plated, high-strength, copper bus with copper ground bus.
3. Tin-plated copper feeder circuit-breaker line connections.
4. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with compression connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
5. Ground Bus: Minimum-size required by UL 891**,** hard-drawn copper of 98 percent conductivity, equipped with compression connectors for ground conductors.
6. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
7. Disconnect Links:

    a. Isolate neutral bus from incoming neutral conductors.
    b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.

8. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with compression connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

R. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.3 SURGE PROTECTION DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Advanced protection Technologies
2. Eaton
3. General Electric Company
4. Siemens Industry, Inc.
5. Square-D by Schneider Electric

B. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 1.

C. Features and Accessories:

1. Integral disconnect switch.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Indicator light display for protection status.
4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
5. Surge counter.

D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 320 kA per phase. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 208Y/120 V.
3. Line to Line: 1000 V for 208Y/120 V.

F. SCCR: Equal or exceed 200 kA.

G. Nominal Rating: 20 kA.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long and short time adjustments.
    d. Ground-fault pickup level, time delay, and I squared t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
7. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
8. MCCB Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Compression style, suitable for number, size, trip ratings, and conductor material.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
e. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
f. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
g. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.

B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

2.5 INSTRUMENTATION

A. Instrument Transformers: NEMA EI 21.1, and the following:

1. Potential Transformers: NEMA EI 21.1; 120 V, 60 Hz, single secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
2. Current Transformers: NEMA EI 21.1; 5 A, 60 Hz, secondary; bar or window type; single secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.
3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kVA.
4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:

a. Phase Currents, Each Phase: Plus or minus 0.5 percent.
b. Phase-to-Phase Voltages, Three Phase: Plus or minus 0.5 percent.
c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 0.5 percent.
d. Megawatts: Plus or minus 1 percent.
e. Megavars: Plus or minus 1 percent.
f. Power Factor: Plus or minus 1 percent.
g. Frequency: Plus or minus 0.1 percent.
h. Accumulated Energy, Megawatt Hours: Plus or minus 1 percent; accumulated values unaffected by power outages up to 72 hours.
i. Megawatt Demand: Plus or minus 1 percent; demand interval programmable from five to 60 minutes.
j. Contact devices to operate remote impulse-totalizing demand meter.

2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.

2.6 CONTROL POWER

A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from control-power transformer.

B. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

C. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.7 ACCESSORY COMPONENTS AND FEATURES

A. Portable Test Set: For testing functions of solid-state trip devices without removing from switchboard. Include relay and meter test plugs suitable for testing switchboard meters and switchboard class relays.

B. Mounting Accessories: For anchors, mounting channels, bolts, washers, and other mounting accessories, comply with requirements in Section 260548.16 "Seismic Controls for Electrical Systems" or manufacturer's instructions.

2.8 IDENTIFICATION

A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, and store switchboards according to NEMA PB 2.1.

B. Install switchboards and accessories according to NEMA PB 2.

C. Equipment Mounting: Install switchboards on concrete base with foundation, nominal thickness as required in the drawings.

1. Install conduits entering underneath the switchboard, entering under the vertical section where the conductors will terminate. Install with couplings flush with the concrete base. Extend 2 inches above concrete base after switchboard is anchored in place.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to switchboards.

6. Anchor switchboard to building structure at the top of the switchboard if required or recommended by the manufacturer.

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.

E. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."

F. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

G. Install filler plates in unused spaces of panel-mounted sections.

H. Install overcurrent protective devices, surge protection devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

I. Install spare-fuse cabinet.

J. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Acceptance Testing:

a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within the switchboard, and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
b. Test continuity of each circuit.

2. Test ground-fault protection of equipment for service equipment per NFPA 70.
3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
5. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

B. Switchboard will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION 262413

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: The work specified in this Section consists of all materials for furnishing, installing connecting, energizing, testing, cleaning and protecting wall- mounted panelboards.

B. Related Section:
1. Section 26 05 00 – Common Work Results for Electrical
2. Section 26 05 28 - Hangers and Supports for Electrical Systems
3. Section 26 05 53 - Identification for Electrical Systems
4. Section 26 05 63 - Acceptance Testing for Electrical Systems
5. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables
6. Section 26 43 13 - Surge Protective Devices (SPD)

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM B164 Nickel-Copper Alloy, Bar and Wire.
2. ASTM B187 Standard Specifications for Copper Bus, Bus Bar, Rod and Shapes

B. National Electrical Manufacturers Association (NEMA):
1. NEMA 250 Electrical Enclosures.
2. NEMA AB 1 Molded Case Circuit Breakers and Molded Case Switches.
3. NEMA AB 2 Molded Case Circuit Breakers and their Application.
4. NEMA PB 1 Panelboards.
5. NEMA PB 1.1 General Instructions for Proper installation, Operation, and Maintenance of Panelboards.

C. National Fire Protection Association (NFPA):
1. NFPA 70 National Electrical Code (NEC).

D. Underwriters Laboratories (UL):
1. UL 489 Molded Case Circuit Breakers and Circuit Breaker Enclosures
2. UL 50 Cabinets and Boxes
3. UL 67 Panelboards

1.3 SYSTEM DESCRIPTION

A. Panelboards are connected to system voltages as follows:
1. 208Y/120 Volt, 3-phase, 4-wire.
2. 120/240 Volt, 1-phase, 2-wire.

1.4 SUBMITTALS

A. Testing Agency/Quality Verification: Provide with all product data evidence of testing agency/quality verification, listing, and labeling either by printed mark on the data or by a separate listing card. Provide from product manufacturers a written statement indicating why an item does not have a quality assurance verification. Such statements are subject to the approval of Metro North Railroad.

B. Product Data and Catalog Cuts: Provide product data for all products provided. Indicate clearly the usage and designation of each product.

C. Shop Drawings: Submit shop drawings for all panelboards.

D. Provide manufacturer's instructions for all panelboards.

1.5 SHORT CIRCUIT, ARC-FLASH, PROTECTIVE DEVICE COORDINATION AND HARMONIC DISTORTION STUDY

A. The computerized short-circuit, arc-flash, protective coordination and harmonic study will be performed and submitted as outlined in Section 26 05 00 of these specifications.

B. The Contractor is responsible for supplying the necessary and required information in order that this study may be completed and submitted at least two full calendar weeks prior to submitting Shop Drawings for equipment included the respective studies, submit the preliminary studies and corresponding computer printouts and annotated one-line distribution diagram to Metro North Railroad for review and comment.

1.6 QUALITY ASSURANCE

A. Provide panelboards, which have been design tested in accordance with NEMA PB 1.

B. Provide panelboards which have been production tested in accordance with NEMA PB 1.

C. Conform all work to NFPA 70, National Electrical Code.

D. Install work under supervision of licensed electricians

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Basic Electrical Materials: Those products such as conduit, wireways, wire and connectors, cable, support devices, fasteners, and similar devices as required for work of this Section are as specified in other Sections of these Specifications.

2.2 PANELBOARDS

A. Provide dead-front panelboards as follows:
   1. Accommodate bolt-on molded case circuit breakers as specified below.
   2. Conform to NEMA PB 1 and NFPA 70, Article 384.
   3. Consist of interiors, matching enclosures and covers of a single manufacturer as specified below.
   4. Have circuit breakers of frame sizes, trip ratings, number of poles, and types as scheduled, indicated and noted.
   5. Provide branch circuits phased in sequence vertically and numbered uniformly left to right, top to bottom.

B. Provide panelboards that are fully rated for a short circuit capacity minimum of 22 KAIC or higher base on short circuit study.

C. Interiors: Provide interiors, as follows:
   1. Provide tin plated main, ground and neutral copper buses conforming to ASTM B187 having not less than 98 percent conductivity.
   2. Mount interiors on galvanized steel backplate.
   3. Make provisions for future breakers and for circuit breakers in all future spaces as indicated, scheduled or noted and so that additional breakers can be mounted without additional connectors or extension of busses.

D. Provide solderless type main, sub-feed, and through feed lugs rated for copper and aluminum conductors of size, number and type, as indicated, scheduled and noted on the Drawings.

E. Enclosures:
   1. Provide enclosures conforming to NEMA 250 for the types as indicated, scheduled, noted, and specified. Provide NEMA 4X enclosures unless otherwise indicated on the Drawings.
   2. Fabricate from stainless steel without knockouts.
   3. Provide side, bottom, and top gutters of minimum 4-inch (10cm) width, of minimum 5-1/2 inch (14cm) depth, and sized as indicated, scheduled, and noted and as required by NFPA 70 Article 373 for the actual entry point.
   4. Provide circuit directory of sufficient size to allow 40-characters per circuit; indicate the source of service (i.e. upstream panelboard, switchboard, motor control center, etc.) to the panelboard. Mount the directory in a transparent protective covering.

F. Doors: Provide doors as follows:
   1. Provide concealed hinges and trim clamps.
   2. Provide combination catch and master keyed, flat key lock with two keys for each lock and common keying throughout the facility.

G. Finishes:
   1. Factory finish enclosure cover completely using an electro-deposition process that deposits a complete finish coat of paint on all interior and exterior surfaces as well as bolted joints.
   2. Include in the paint process cleaning, rinsing, phosphatizing, prepaint and post paint rinses, bake-cure and cool down steps.
   3. Finish switchboards with rust inhibiting primers and electro-disposition acrylic baked enamel top coating of No. 49 medium light grey conforming to ANSI Z55.1.

4. Provide overall finish capable of passing a 300-hour salt spray per ASTM B117 with less than 1/8 loss of paint from a scribed line.

H. Molded case circuit breakers:
1. Provide inverse time and instantaneous tripping characteristics.
2. Provide trip ratings, frame sizes, and number of poles as indicated, scheduled, and noted on the Drawings.
3. Provide full rated circuit breakers with short circuit ratings equal to the panelboard installed as scheduled on the Drawings.
4. Provide molded case circuit breakers conforming to NEMA AB 1, and UL 489.
5. Provide circuit breakers of the same manufacture and type as the panelboard installed.
6. New circuit breakers for existing panelboards or loadcenters shall match the existing circuit breaker type, manufacturer, and AIC rating. Circuit breakers that are added into existing equipment shall be new, unless noted on the drawings as existing to be relocated and/or reused; and shall be purchased from an authorized manufacturer's distributor. Purchase of used, reconditioned, or brokered circuit breakers is prohibited unless approved by Metro North Railroad.

I. Surge Protective Devices (SPD): Provide a Surge Protective Device as specified in Section 26 43 13. Factory install and wire SPD within the panelboard prior to shipment to the job site. Mount SPD audible alarm, alarm silence and test switches, and failure indicators (LEDs) on front of panelboard. Provide terminal blocks for external circuit connections.

J. Panelboard Types:
1. Distribution - Square D I-Line.
2. Branch Power and Lighting (208Y/120V) - Square D NQOD.
3. Branch Power and Lighting (480Y/277V) - Square D NF.
4. Branch Power (480Y/277V) - Square D I-Line.

K. Acceptable Manufacturers:
1. Square D Company
2. Eaton Electric
3. General Electric
4. Siemens Industry for LV Power Distribution
5. Or Approved Equal

PART 3 - EXECUTION

3.1 PREPARATION

A. Painted surfaces, which will be covered by items of this Section have a prime and finish coat of paint.

B. Ensure that all indoor areas are enclosed from the weather.

3.2 INSTALLATION

A. Space enclosures out from surfaces mounted on 1/4-inch (6mm) spacers or U- channel supports. Provide supports as specified in Section 26 05 28.

B. Install all panelboards and circuit-breakers in accordance with the manufacturer's instructions and NEMA PB 1.1.

C. Set enclosure top 6-feet 6-inches above finished floor or grade unless otherwise indicated or specified.

D. Punch holes for conduit entries in the enclosures.

E. In all areas except dry areas, install conduit drain fitting in punched hole in bottom of enclosure, conduit breather fitting in top of enclosure.

F. Interface with other work:
   1. Connect conduits to enclosure with watertight hubs, except in damp locations on the bottom of enclosures a sealing locknut may be used in place of watertight hubs, and in dry locations two locknuts and bushings may be used.
   2. Connect wiring to line and load terminals with lugs provided or approved by manufacturer in conformance with Section 26 05 19. Remove interior or protect interior components during wire pulling.
   3. Identify in accordance with Section 26 05 53.

G. At the end of the project update the circuit directories to reflect as-built conditions. Circuit directions shall be typed.

3.3 CLEANING

A. After wiring, vacuum out interior and wipe clean of all foreign material.

B. After painting in areas, remove all over paint, drips and splashes.

3.4 FIELD QUALITY CONTROL

A. Site Testing:
   1. Prior to Energizing:
      a. Have insulation testing and setting of overcurrent protective device adjustments made in conformance of Section 26 05 63.
      b. Ensure that all load side wiring is clear of shorts and has received and passed the insulation tests of Section 26 05 63.
      c. Open all downstream disconnects and open circuit breaker.
   2. Final testing after energizing:
      a. Perform thermographic test and record circuit parameters in conformity with Section 26 05 63.

3.5 PROTECTION

A. During painting, mask all nameplates, all plastic parts, and all items not to be painted.

B. Protect all items during work of other trades including welding and cutting.

C. Protect panelboards against overloads, short circuits, and improper operation, padlock off when work is being done on downstream circuits.

END OF SECTION

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, connecting, energizing, testing, cleaning, and protecting wiring devices and cover plates.

B. Related Sections:
   1. Section 01 33 00 - Submittal Procedures.
   2. Section 26 05 00 - Common Work Results for Electrical.
   3. Section 26 05 26 - Grounding and Bonding.
   4. Section 26 05 28 - Hangers and Supports for Electrical Systems.
   5. Section 26 05 63 - Acceptance Testing for Electrical Systems.
   6. Section 26 05 53 - Identification for Electrical Systems.
   7. Section 26 05 33.13 - Conduit for Electrical Systems
   8. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables.
   9. Section 26 05 33.16 - Boxes for Electrical Systems

1.2 REFERENCES

A. National Electric Manufacturer's Association (NEMA):
   1. NEMA WD 1 - General Color Requirements for Wiring Devices.
   2. NEMA WD 6 - Wiring Devices - Dimensional Requirements.

B. National Fire Protection Association (NFPA):
   1. NFPA 70 - National Electrical Code (NEC).

C. Underwriter’s Laboratories, Inc. (UL):
   1. UL 20 - Standard for Safety for General-Use Snap Switches.
   2. UL 231 - Standard for Power Outlets.
   3. UL 498 - Standard for Safety for Attachment Plugs and Receptacles.
   4. UL 943 - Standard for Safety for Ground-Fault Circuit-Interrupters.
   5. UL 1449 - Standard for Transient Voltage Surge Suppressors.
   6. UL 1472 - Solid-State Dimming Controls.
   7. UL 1681 - Standard for Safety for Wiring Device Configurations.

D. U. S. General Services Administration (GSA):
   1. Federal Specifications:
      a. W-C-596/40D - Connector, Receptacle, Electrical, General Purpose, Duplex, General Grade and Hospital Grade, Grounding, 2 Pole, 3 Wire, 20 Amperes, 125 Volts, 50/60 Hertz, Box Mount and Snap-In Mount.
      b. W-C-596/41D - Connector, Receptacle, Electrical, General Purpose, Single, Hospital Grade, Grounding, 2 Pole, 3 Wire, 20 Amperes, 125 Volts, 50/60 Hertz.

c. W-C-596/107A - Connectors, Receptacle, Electrical, Special Purpose, Single, Grounding, 2 Pole, 3 Wire, 20 Amperes, 277 Volts, 50/60 Hertz.
d. W-S-896F - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification).

1.3 DEFINITIONS

A. Definitions for all items are as stated in NFPA 70 and the other references listed unless otherwise stated, specified, or noted.

B. SPDT: An acronym for single pole, double throw type electrical switches.

C. Wiring Devices: Yoke mounted switches and receptacles with indicated line ratings of 300 Volts and 30 Amperes or less.

1.4 DESIGN REQUIREMENTS

A. Provide electrical power outlets designed in accordance with the requirements of UL 231 and UL 1681.

B. Product Data:
1. Submit a list of the products and accessories proposed to satisfy the requirements of this Section.
2. Submit Product Data and catalog cuts of the materials and equipment proposed to be used to satisfy the requirements of this Section.
   a. Clearly indicate the usage of each product on the submittal.
3. Include Product Data for the equipment and material provided under this Section with the Operation and Maintenance Manuals at project closeout.

1.5 SUBMITTALS

A. Submit the following information to the Engineer for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
1. Product Data:
   a. List of the proposed materials.
   b. Catalog cuts of toggle handle snap switches.
   c. Catalog cuts of control switches.
   d. Catalog cuts of dimmer switches.
   e. Catalog cuts of emergency power shut-off switches.
   f. Catalog cuts of self contained occupancy sensor switches.
   g. Catalog cuts of heavy duty specification grade receptacles.
   h. Catalog cuts of heavy duty specification grade GFCI receptacles.
   i. Catalog cuts of power outlet receptacles.
   j. Catalog cuts of device plates and covers.
2. Quality Assurance/Control Submittals:
   a. Test Reports.
      1) Test reports for Site tests.
   b. Certificates.

1) Testing agency/quality verification, listing, and labeling.

c. Manufacturers Instructions.
   1) Manufacturer's printed installation instructions.

d. Qualification Statements.
   1) Qualifications of the Electrical Testing Laboratory (ETL).

1.6 QUALITY ASSURANCE

A. Qualifications:
   1. Electrical Testing Laboratory (ETL) Qualifications:
      a. Employ an independent testing agency, qualified as specified in Section 26 05 63, Acceptance Testing for Electrical Systems, to perform testing required by this Section.
      b. Submit information verifying the ETL's qualifications.

B. Regulatory Requirements:
   1. Perform the Work of this Section in accordance with the requirements specified in NFPA 70, and to all other applicable state, local, and national governing codes and regulatory requirements.

C. Certifications:
   1. Provide products that are listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location installed in, and the application intended, unless products meeting the requirements of these testing laboratories are not available or unless standards do not exist for the products. Provide copper conductors listed and labeled by UL for all wiring.
   2. Submit evidence of testing agency/quality verification, listing, and labeling for each product with the submitted product data either by providing a printed mark on the data or by attaching a separate listing card.
      a. For items without such evidence, submit a written statement from the product manufacturer that indicates why it does not have quality assurance verification.

1.7 MATERIAL DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Pack, ship, handle, and unload products in accordance with the requirements of Section 26 05 00, Basic Common Work Results for Electrical.

B. Acceptance at Site:
   1. Accept products at the Site in accordance with the requirements of Section 26 05 00, Basic Common Work Results for Electrical.

C. Storage and Protection:
   1. Store products in accordance with the requirements of Section 26 05 00, Basic Common Work Results for Electrical.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Use of Trade Names:
   1. The use of trade names within the Contract Documents is intended to establish the basis of design and to illustrate the constructability and level of quality required.
   2. The use of trade names is not intended to exclude other manufacturers whose products are equivalent to those named, subject to compliance with Contract requirements.

B. Provide the switches and receptacles of the same kind provided under this Contract from the same manufacturer; a mixture of manufacturers' products is unacceptable.

2.2 MANUFACTURED UNITS

A. Switches:
   1. Provide UL listed specification grade switches meeting the requirements of W-S-896F, NEMA WD 1, and NEMA WD 6 for the voltage and current indicated, and having screw terminals.
   2. Toggle Handle Snap Switches:
      a. Provide quiet design, 20 Amp rated, single pole, 3-way or 4-way, toggle handle snap switches as indicated in the Contract Documents.
      b. Control Switches:
         1) For control switches, provide SPDT switches with center OFF and maintained contacts, or SPDT with center OFF and momentary contacts, of the same basic type, construction, and rating as specified for other toggle handle snap switches.
         2) Provide switch with terminals rated for both solid and stranded wire.
         3) See the Contract Drawings for additional information.
      c. Manufacturers:
         1) Hubbell, www.hubbell-wiring.com.
            a) Heavy Duty Specification Grade Switches: HBL1220 Series.
            b) Construction Series Heavy Duty Specification Grade Switches: CS120 Series.
         2) Pass & Seymour, www.passandseymour.com.
         3) Leviton Manufacturing Co., www.leviton.com.
         4) Approved equal.
   3. Dimmer Switches:
      a. Provide slide type, solid-state, positive off dimmer switches that comply with the requirements of UL 20 and UL 1472.
         1) Provide fully rated dimmer switches rated for a minimum of 1500 Watts, provide a larger size if necessary to accommodate the loads indicated on the Contract Drawings.
         2) Provide dimmer switches rated for incandescent or fluorescent lighting as shown on the Contract Drawings, and capable of being gang mounted without breaking off their cooling fins.
         3) Provide switch with terminals rated for both solid and stranded wire.
      b. Manufacturers:
         1) Lutron, "Nova" Series, www.lutron.com.

2) Pass & Seymour, www.passandseymour.com.
3) Leviton Manufacturing Co., www.leviton.com.
4) Or Approved Equal.

4. Emergency Power Shut-Off Switches:
   a. Provide a heavy duty, momentary contact pushbutton shut-off switch rated for 600 Volts AC.
   b. Provide flush mounted switches furnished with a 1-3/8-inch diameter red mushroom type stop button and a stainless steel cover plate.
   c. Provide switch with terminals rated for both solid and stranded wire.
   d. Manufacturers:
      1) Square D Company
      2) General Electric
      3) Eaton/Cutler-Hammer
      4) Siemens Industry for LV Power Distribution
      5) Approved equal.
5. Self Contained Occupancy Sensor Switches:
   a. Provide self-contained, single gang, occupancy and vacancy sensor switches designed to fit behind a standard decorator switch plate and to replace existing wall switches.
      1) Provide occupancy and vacancy sensor switches rated for dual 120/277 Volt operation.
      2) Provide occupancy and vacancy sensor switches having a passive infrared detector mounted behind a Fresnel lens.
      3) Provide switch with terminals rated for both solid and stranded wire.
   b. Sensitivity:
      1) Provide occupancy and vacancy sensor switches capable of detecting motion in 10 to 150 foot-candles, and capable of detecting both vertical and horizontal motion.
   c. Coverage:
      1) Sensing Field: 180 degrees.
      2) Sensing Distance: Up to 35 feet.
      3) Sensing Area: Up to 900 square feet.
   d. Time Delay:
      1) Provide occupancy and vacancy sensor switches having a time delay adjustable from 30 seconds to 30 minutes.
   e. Acceptable Manufacturers for interior dry/conditioned locations:
      1) Pass & Seymour, WSP200, www.passandseymour.com.
      2) Sensorswitch – LWS PDT
      3) Or Approved Equal
   f. Acceptable Manufacturers for interior unconditioned locations with low temperature and/or high humidity:
      1) Sensorswitch - LWS PDT LT.
      2) Or Approved Equal

B. Receptacles:
   1. Provide UL listed specification grade receptacles complying with the requirements of W-C-596/40D, W-C-596/41D, W-C-596/107A, NEMA WD 1, and NEMA WD 6 for the voltage and current indicated, and having screw terminals.
      a. Provide receptacles complying with the terminal identification requirements of UL 498.
   2. Standard Face Design Receptacles:

a. Heavy Duty Specification Grade Receptacles:
   1) Provide 2-pole, 3-wire, grounding type duplex receptacles rated for 125 Volts AC and 20 Amperes.
   2) Provide receptacles with terminals rated for both solid and stranded wire.
   3) Manufacturers:
      a) Hubbell, HBL5352 Series, www.hubbell-wiring.com.
      b) Pass & Seymour, www.passandseymour.com.
      c) Leviton Manufacturing Co., www.leviton.com.
      d) Or Approved Equal.

b. Construction Series Heavy Duty Specification Grade Receptacles:
   1) Provide 2-pole, 3-wire, grounding type duplex receptacles rated for 125 Volts AC and 20 Amperes, and having a finder groove nylon face.
   2) Provide receptacles with terminals rated for both solid and stranded wire.
   3) Manufacturers:
      a) Hubbell, 5362 Series, www.hubbell-wiring.com.
      b) Pass & Seymour, www.passandseymour.com.
      c) Leviton Manufacturing Co., www.leviton.com.
      d) Or Approved equal.

3. Ground Fault Circuit Interrupter (GFCI) Receptacles:
   a. Heavy Duty Specification Grade GFCI Receptacles:
      1) Provide 2-pole, 3-wire, grounding type duplex GFCI receptacles rated for 125 Volts AC and 20 Amperes; having solid state circuitry; and that comply with the requirements of UL 498 and UL 943.
      2) Provide receptacles with terminals rated for both solid and stranded wire.
      3) Manufacturers:
         a) Hubbell, GFR5362TR Series, www.hubbell-wiring.com.
         b) Pass & Seymour, www.passandseymour.com.
         c) Leviton Manufacturing Co., www.leviton.com.
         d) Or Approved Equal.

4. Isolated Ground Receptacles:
   a. Provide receptacles rated for 125 Volts AC and 20 Amperes.
   b. Provide receptacles with terminals rated for both solid and stranded wire.
   c. Manufacturers:
      1) Hubbell, www.hubbell-wiring.com.
         a) Isolated Ground Receptacles: IG5362 Series.
         b) Construction Series Isolated Ground Receptacles: CR5352IG Series.
      2) Pass & Seymour, www.passandseymour.com.
      3) Leviton Manufacturing Co., www.leviton.com.
      4) Or Approved Equal.

5. Power Outlet Receptacles:
   a. Provide heavy-duty, polarized, grounding type power outlet receptacles rated for the voltage and amperage indicated in the Contract Documents.
   b. Provide receptacles with terminals rated for both solid and stranded wire.
   c. Manufacturers:
      1) Hubbell, Twist-Lock and straight blade, www.hubbell-wiring.com.
      2) Pass & Seymour, www.passandseymour.com.
      3) Leviton Manufacturing Co., www.leviton.com.
      4) Or Approved Equal.

2.3 ACCESSORIES

A. Wall Plates:
1. Unless otherwise indicated in the Contract Documents, provide AISI Type 302/304 stainless steel wall plates.
    a. For use with exposed stamped steel boxes and cast type boxes, provide heavy cadmium-plated steel wall plates whose edges are flush with the edges of the associated boxes.
    b. For pushbutton or buzzer outlet boxes, provide wall plates having openings to suit the pushbuttons or buzzers.
    c. For locations subject to wet or rain conditions, provide wet location wall plates marked with the words “Suitable for Wet Locations While in Use”.
2. Thickness (Minimum): 0.040 inches thick (1mm).
3. Finish:
    a. For finished areas, provide wall plates having a satin finish.
    b. For emergency circuits, provide either a red or Type 302/304 stainless steel wall plate engraved with the word “EMERGENCY” and with the panel designation and circuit number.
4. Fasteners:
    a. For installing wiring devices and wall plates, provide the following of fastener types:
        1) For affixing plastic wall plates, provide nylon screws.
        2) For affixing metal wall plates, provide plated screws except as follows:
            a) For other than dry locations, provide stainless steel hardware.
5. Manufacturers:
    a. Hubbell, www.hubbell-wiring.com.
    b. Pass & Seymour, www.passandseymour.com.
    c. Appleton, www.appletonelec.com.
    d. Cooper Crouse-Hinds, http://crouse-hinds.com.
    e. Or Approved Equal.

B. Weatherproof While-In-Use Covers:
1. Body, cover and plates shall be made of polycarbonate and be non-conductive and non-corrosive.
2. A gasket shall be pre-applied that is constructed of closed-cell foam, neoprene blend regular density and UL rated HBF.
3. Cover shall provide a water channel, which keeps water moving outside while cord flap keeps the inside dry.
4. Cover shall be able to mount either vertically or horizontally.
5. Must provide a NEMA 3R protection level.
6. Manufacturers:
    a. Hubbell, www.hubbell-wiring.com.
    b. Pass & Seymour, www.passandseymour.com.
    c. Leviton Manufacturing Co., www.leviton.com.
    d. Or Approved Equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect the surfaces of concrete foundations where wiring devices will be mounted to verify that the surface is level and complete.
   1. Verify that the required number of anchors of the correct type and size have been placed in the proper locations.
   2. Verify that there are no concrete spalls, honeycomb areas, or other concrete defects.

B. Verify that the pull and junction boxes installed are the correct type and size, and are at the correct location.
   1. Verify that flush boxes are plumb and level to within 1/8-inches of vertical and horizontal; and are either flush with the finish surface or protrude no more than 1/16 inch.
   2. Verify that surface mounted boxes are plumb and level to within 1/16-inch of vertical and horizontal.
   3. Verify that the size of each box conforms to the requirements of Article 370 of NFPA 70.

C. Verify that wiring pigtails within installed boxes are sufficiently long to re-terminate the wiring twice and still allow 6 inches of slack.

D. Verify that ground wires are the correct type and size, and are at the correct location.

3.2 PREPARATION

A. Correct defects discovered during the examination
   1. Remove any extraneous paint from the interior of boxes and from wiring.
   2. Clean the interior of boxes to remove dirt and debris.

B. Provide outlet boxes and supports for wiring devices in accordance with the requirements of Section 26 05 33.16, Boxes for Electrical Systems, and Section 26 05 28, Hangers and Supports for Electrical Systems.
   1. Mounting Locations and Heights:
      a. Unless otherwise specified or shown on the Contract Drawings, locate wiring devices by measuring the mounting heights from the finished floor to the centerline of the wiring device.
         1) Emergency Power Shut-Off Switches:
            a) Locate emergency power shut-off switches 5’- 0” above the finished floor on the hinge side of the exit door, or where shown on the Contract Drawings.
         2) Lighting Control Switches:
            a) Locate lighting control switches on the strike side of doors, and at 48-inches above the finished floor to the centerline of the switch, unless indicated otherwise on the Contract Drawings.
            b) Where it is not possible to mount lighting control switches side-by-side with a common device plate, mount them in tandem.
         3) Electrical Duplex Convenience Outlets:
            a) In Finished Areas:

(1) Locate electrical duplex convenience outlets 18 inches above the finished floor to the centerline of the outlet, unless indicated otherwise on the Contract Drawings.
(2) In concrete block walls, locate convenience outlets so they fall at the top of the second course, and at the top center of the respective block in which they are placed.
(3) Locate electrical duplex convenience outlets that are above counters or backsplashes horizontally 6 inches above the counter or backsplash.

b) In Unfinished Areas:
(1) Locate electrical duplex convenience outlets 36 inches above the finished floor, unless this interferes with equipment or another obstacle.
(2) If locating electrical duplex convenience outlets 36 inches above the finished floor interferes with equipment or another obstacle; then install the outlet above or below the obstruction as directed by the Engineer.

c) For Water Coolers Receptacles:
(1) Locate electrical outlets for water coolers directly behind the water cooler in order to hide the cord and attachment plug.
(2) Prior to installing the box for the outlet, coordinate the mounting height of the wiring device with the height of the cooler to be installed to insure that the cord and attachment plug will be hidden.

4) Wiring Devices in Mill Work:
a) Mount wiring devices in mill work where shown in details or elevations, or as directed by the Engineer.

3.3 INSTALLATION

A. Install wiring devices and accessories in accordance with the manufacturer's printed installation instructions.
1. Submit the manufacturer's printed installation instructions to the Engineer for information.
2. Make connections to the devices in accordance with the requirements of Sections 26 05 19, Low Voltage Electrical Power Conductors and Cables, and Section 26 05 33.13, Conduit for Electrical Systems.
3. Ground the devices in accordance with the requirements of Section 26 05 26, Grounding and Bonding.
4. Emergency Circuits:
a. Emergency Power Shut-Off Switches:
1) Boilers:
a) Connect the emergency power shut-off switch for each boiler into the main run contact serving the respective boiler control panel.
b. Provide red receptacles for emergency circuits.

B. Provide a wall plate for each switch, receptacle, and special purpose outlet.
1. If the Contract Drawings show two or more switches or receptacles at the same location, gang these devices together and cover them with a single wall or cover plate.

2. For multi-gang boxes, provide multi-gang outlet plates; sectional gang plates are unacceptable.

C. Identify the wiring devices in accordance with the requirements of Section 26 05 63, Acceptance Testing for Electrical Systems.
1. Label emergency power shut-off switches appropriately.

3.4 REPAIR/RESTORATION

A. Correct the defects that are found in wiring devices during the specified inspections and tests, and retest the devices after correcting the defects.

3.5 FIELD QUALITY CONTROL

A. Site Tests:
1. Test each receptacle with a plug-in tester that checks for reversed line and neutral wiring, reversed ground and neutral wiring, open ground wiring, and open neutral wiring.
2. Verify that the GFCI receptacles work by using both the built-in integral tester and a plug-in tester which simulates a ground fault to test all receptacles.
3. Test the last receptacle in each branch circuit to ensure that the neutral and ground wiring resistance does not exceed 1 ohm between the receptacle and its panelboard.
4. Record and submit the results of the tests to the Engineer for approval.

B. Inspection:
1. Inspect boxes to verify proper operation, for visual appearance, and to verify correct mounting height.

3.6 ADJUSTING

A. Adjust the final position of switches and devices to be plumb and level, and set the final position of the wall plates for flush boxes flush to the wall.

3.7 CLEANING

A. Waste Management and Disposal:
1. Clear and dispose of waste materials in accordance with the requirements of Section 26 05 00, Common Work Results for Electrical.

3.8 PROTECTION

A. Mask electrical devices to protect them from paint overspray or over-brushing during painting operations.

B. Protect electrical devices against damage from other work.

3.9 SCHEDULES

END OF SECTION

SECTION 26 28 16.19 - LOW VOLTAGE ENCLOSED CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, connecting, energizing, testing, cleaning, and protecting enclosed, low-voltage, individually mounted molded-case circuit breakers.

B. Related Sections:
   1. Section 26 05 28 - Hangers and Supports for Electrical Systems.
   2. Section 26 05 53 - Identification for Electrical Systems.
   3. Section 26 05 63 - Acceptance Testing for Electrical Systems.
   4. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM B 258, Standard Specification for Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors.

B. National Electrical Manufacturers Association (NEMA):
   1. NEMA 250; Enclosures for Electrical Equipment (1000 Volts Maximum).
   2. NEMA AB 1; Molded-Case Circuit Breakers, Molded Case Switches, and Circuit-Breaker Enclosures.

C. National Fire Protection Association (NFPA):
   1. NFPA 70; National Electrical Code (NEC).

D. Underwriter's Laboratories, Inc. (UL):
   1. UL 489; Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit- Breaker Enclosures.

1.3 DEFINITIONS

A. AIC: An acronym for ampere interrupting capacity.

B. AWG: An acronym for American Wire Gage, which is a standard system of designating electrical wire sizes specified in ASTM B 258.

1.4 DESIGN REQUIREMENTS

A. Design molded-case circuit breakers in conformance with the requirements of both NEMA AB 1 and UL 489.

1.5 SUBMITTALS

A. Submit the following information for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
   1. Product Data:
      a. Enclosed molded-case circuit breakers
      b. Circuit breaker enclosures
   2. Shop Drawings:
      a. Enclosed molded-case circuit breakers
   3. Quality Assurance/Control Submittals:
      a. Certificates:
         1) Testing agency/quality verification listing cards, if required
         2) Manufacturers written statement indicating why items do not have quality assurance verification, if required
      b. Manufacturer's instructions:
         1) Enclosed circuit breakers

1.6 SHORT CIRCUIT, ARC-FLASH, PROTECTIVE DEVICE COORDINATION AND HARMONIC DISTORTION STUDY

A. The computerized short-circuit, arc-flash, protective coordination and harmonic study will be performed and submitted as outlined in Section 26 05 00 of these specifications.

B. The Contractor is responsible for supplying the necessary and required information in order that this study may be completed and submitted at least two full calendar weeks prior to submitting Shop Drawings for equipment included the respective studies, submit the preliminary studies and corresponding computer printouts and annotated one-line distribution diagram to Metro North Railroad for review and comment.

1.7 QUALITY ASSURANCE

A. Qualifications:
   1. Employ licensed electricians to supervise installation of the work of this Section.

B. Regulatory Requirements:
   1. Conform all work to NFPA 70, the National Electrical Code.

C. Certifications:
   1. Provide products that are either listed and labeled by Underwriters Laboratory, approved by factory mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location installed in, and the application intended, unless products meeting the requirements of these testing laboratories are not available or unless standards do not exist for the products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Use of Trade Names:
   1. The use of trade names within the Contract Documents is intended to establish the basis of design and to illustrate the constructability and level of quality required.
   2. The use of trade names is not intended to exclude other manufacturers whose products are equivalent to those named, subject to compliance with Contract requirements.

B. Provide circuit-breaker enclosures from the same manufacturer as the circuit-breaker.

C. Acceptable Manufacturers:
   1. Manufacturers offering products which can meet the requirements of this Section include, but are not limited to, the following:
      a. Square D Company
      b. Eaton Electric
      c. General Electric
      d. Siemens Industry for LV Power Distribution
      e. Or Approved Equal

2.2 MANUFACTURED UNITS

A. Enclosed Molded-Case Circuit-Breakers:
   1. Provide quick make-quick break, unit type molded-case circuit breakers with a thermal magnetic overload trip and lugs on both ends.
      a. Equip the circuit breakers with mechanically trip-free toggle handles.
      b. Equip multiple pole breakers with an internal common trip.
      c. Provide 15 and 20 ampere circuit breakers with lugs capable of accommodating one wire between 14 AWG and 10 AWG.
   2. Provide circuit breakers with the Voltage rating, poles, trip setting, and UL listed AIC rating 22,000 minimum or higher as required by short circuit study. Provide factory-installed accessories as indicated and specified.

B. Enclosures:
   1. Provide enclosures conforming to the requirements of NEMA 250, type 4X, stainless steel.
      a. Provide enclosures of the type indicated or scheduled on the Contract Drawings.
      b. Unless otherwise indicated or scheduled, provide surface-mounted enclosures.
   2. Provide enclosures sized to contain the circuit breaker and all other required items.
      a. Provide an interlock that prevents opening the enclosure door when the circuit breaker is in the “ON” position.
         1) Provide an interlock defeater, which requires a common hand-tool to operate.
      b. Provide a copper ground-bus or ground-stud rated for 100 percent of the circuit breaker’s capacity.
   3. Provide each enclosure with an external operator that positively indicates the “ON”, “OFF”, and “TRIPPED” positions of the enclosed circuit breaker.

4. Provide the capability to pad-lock the circuit breaker in the “ON” and the “OFF” positions by using three padlocks.
5. If the circuit-breaker is connected to a system with a grounded neutral, provide a copper solid-neutral bus or terminal-lug with a 100 percent rating, and suitable lugs for all incoming and outgoing cables.

2.3 SOURCE QUALITY CONTROL

A. Testing Agency/Quality Verification:
   1. Perform the standard circuit breaker factory tests specified in NEMA AB 1 and UL 489.
   2. Submit evidence of testing agency/quality verification, listing, and labeling for each product with the submitted product data either by providing a printed mark on the data or by attaching a separate listing card.
      a. For items without such evidence, provide a written statement from the product manufacturer that indicates why it does not have quality assurance verification.
      b. Such statements are subject to the approval of Metro North Railroad.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Install the work of this Section only under the supervision of licensed electricians.

3.2 PREPARATION

A. Provide a prime and finish coat of paint for painted surfaces that will be covered by items provided under this Section.

B. Prior to painting operations, mask all nameplates, plastic parts, operating shafts, and other items not to be painted.

C. Ensure that all indoor areas to receive the items provided under this Section are enclosed from the weather.

3.3 INSTALLATION

A. Install circuit breakers in accordance with the circuit breaker manufacturer’s instructions.
   1. Mount enclosures on 1/4-inch (6mm) spacers or U-channel supports to provide a space between enclosures and mounting surfaces.
      a. Provide supports as specified in Section 26 05 28, Hangers and Supports.
   2. Set the top of enclosures 6’-6” above the finished floor or grade unless otherwise indicated or specified.

B. Install circuit breaker conduit and wiring:
   1. Punch holes in the enclosures for conduit entries.
   2. In dry locations, two locknuts and bushings may be used to connect conduits to the circuit breaker enclosure.

3. In damp locations and on the bottom of enclosures, connect conduits to the circuit breaker enclosure with watertight hubs or a sealing locknut.
4. Except in dry areas, install a conduit drain-fitting in a hole punched in the bottom of the enclosure, and install a conduit breather fitting in the top of the enclosure.
5. Remove or protect components installed in the interior of enclosures during wire pulling.
6. Use lugs provided or approved by the circuit breaker manufacturer to connect wiring to the circuit breaker's line and load terminals in conformance with Section 26 05 19, Low Voltage Electrical Power Conductors and Cables.

C. Identify circuit breakers in accordance with Section 26 05 63, Acceptance Testing for Electrical Systems.

3.4 FIELD QUALITY CONTROL

A. Site Testing:
   1. Prior to energizing the circuit breakers:
      a. Perform insulation testing and ensure that all load-side wiring is clear of shorts in accordance with the requirements of Section 26 05 63, Acceptance Testing for Electrical Systems.
      b. Set and adjust overcurrent protective devices in conformance with the requirements of Section 26 05 63, Acceptance Testing for Electrical Systems.
      c. Open all downstream disconnects and the circuit breaker.
   2. Final testing after energizing the circuit breakers:
      a. Perform the thermographic test in conformity with Section 26 05 63, Acceptance Testing for Electrical Systems, and record the circuit parameters.

3.5 PROTECTION

A. Protect the items provided under this Section during the performance of work provided under other Sections, especially during welding and cutting operations.

B. Protect circuit breakers against overloads, short-circuits, and improper operation.
   1. Pad-lock the circuit breakers in the off position when work is being done on downstream circuits.

END OF SECTION

SECTION 26 28 16.13 - LOW VOLTAGE ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for furnishing, installing, connecting, energizing, testing, cleaning, and protecting enclosed disconnect switches, hazardous location switches, and fuses.

B. Related Sections:
   1. Section 26 05 28 - Hangers and Supports for Electrical Systems.
   2. Section 26 05 53 - Identification for Electrical Systems.
   3. Section 26 05 63 - Acceptance Testing for Electrical Systems.
   4. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables.

1.2 REFERENCES

A. InterNational Electrical Testing Association, Inc. (NETA):
   1. ANSI/NETA ETT Standard for Certification of Electrical Testing Technicians.

B. National Electrical Manufacturers Association (NEMA):
   1. NEMA 250; Enclosures for Electrical Equipment (1000 Volts Maximum).
   2. NEMA KS 1; Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

C. National Fire Protection Association (NFPA):
   1. NFPA 70; National Electrical Code (NEC).

D. Underwriter's Laboratories, Inc. (UL):
   1. UL 98; Standard for Enclosed and Dead-Front Switches.

1.3 SUBMITTALS

A. Submit the following information for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
   1. Product Data:
      a. Enclosed disconnect switches
      b. Enclosed hazardous location switches
      c. Fuses
   2. Shop Drawings:
      a. Enclosed disconnect switches
      b. Enclosed hazardous location switches
   3. Quality Assurance/Control Submittals:
      a. Certificates:
         1) Testing agency/quality verification listing cards, if required

2) Manufacturers written statement indicating why items do not have quality assurance verification, if required

b. Manufacturer's instructions:
1) Enclosed disconnect switches

c. Qualification Statements:
1) Electrical testing laboratory's qualifications

1.4 SHORT CIRCUIT, ARC-FLASH, PROTECTIVE DEVICE COORDINATION AND HARMONIC DISTORTION STUDY

A. The computerized short-circuit, arc-flash, protective coordination and harmonic study will be performed and submitted as outlined in Section 26 05 00 of these specifications.

B. The Contractor is responsible for supplying the necessary and required information in order that this study may be completed and submitted at least two full calendar weeks prior to submitting Shop Drawings for equipment included the respective studies, submit the preliminary studies and corresponding computer printouts and annotated one-line distribution diagram to Metro North Railroad for review and comment.

1.5 QUALITY ASSURANCE

A. Qualifications:
1. Installer Qualifications:
a. Employ licensed electricians to supervise installation of the work of this Section.
2. Electrical Testing Laboratory (ETL) Qualifications:
a. Use a NETA accredited electrical testing laboratory, or approved equal, that is accredited according to ANSI/NETA ETT for the region in which the Contract work is performed.
b. Submit the electrical testing laboratory's qualifications to Metro North Railroad for approval.

B. Regulatory Requirements:
1. Conform all work to NFPA 70, the National Electrical Code.

C. Certifications:
1. Provide products that are either listed and labeled by Underwriters Laboratory, approved by Factory Mutual, or certified as meeting the standards of UL by the Electrical Testing Laboratory (ETL) for the location installed in, and the application intended, unless products meeting the requirements of these testing laboratories are not available or unless standards do not exist for the products.

1.6 MAINTENANCE

A. Extra Materials:
1. Provide one set of spare fuses for each point of use including all of the ampere sizes indicated for the location.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Use of Trade Names:
   1. The use of trade names within the Contract Documents is intended to establish the basis of design and to illustrate the constructability and level of quality required.
   2. The use of trade names is not intended to exclude other manufacturers whose products are equivalent to those named, subject to compliance with Contract requirements.

2.2 MANUFACTURED UNITS

A. Enclosed Disconnect Switches:
   1. Provide enclosed disconnect switches that meet the requirements of NEMA KS l and UL 98, and that are as shown on the Contract Drawings.
      a. Types:
         1) Heavy duty fusible type.
            a) Provide positive pressure fuse clips.
            b) Provide fuses as specified
         2) Heavy duty non-fusible type.
      b. Provide enclosed disconnect switches rated for the horsepower, voltage, and amperage as indicated on the Contract Drawings.
      c. Provide enclosed disconnect switches with the number of poles and of the type indicated on the Contract Drawings.
   2. Enclosure:
      a. Provide enclosures consisting of a box and cover conforming to the requirements of NEMA 250 and of the type indicated or scheduled on the Contract Drawings.
         1) If not otherwise specified, provide enclosures conforming to the requirements of NEMA 250, type 1.
      b. Material:
         1) Construct enclosures of code gauge sheet steel per the requirements of UL 98.
      c. Finish:
         1) Apply a rust-inhibiting phosphate coating to the enclosure's sheet steel, and then finish the enclosure in gray baked enamel.
      d. Provide a permanent label with the manufacturer's switch type, catalog number, and horsepower rating on the enclosure.
   3. Switch Mechanism:
      a. Provide a quick-make, quick-break operating handle and switch mechanism integral to the box or body, not the cover.
         1) Provide dead front construction with permanent arc suppressors and dual cover interlocks to prevent an unauthorized opening of the switch enclosure when the switch is in the ON position.
         2) Provide the means to positively padlock the switch in the OFF position.
      b. Provide a switch designed so that the switch blades are visible in the OFF position when door is open.
      c. Provide UL-listed switch lugs for front removable copper cables.
      d. Electroplate the switch's current carrying parts to provide resistance to corrosion.
   4. Acceptable Manufacturers:

a. Square D Company
b. Eaton Electric
c. General Electric
d. Siemens Industry for LV Power Distribution
e. Or Approved Equal

B. Fuses:
1. Provide current limiting type fuses rated for the voltage and amperage as indicated on the Contract Drawings for those low-voltage switches requiring fuses.
a. For non-motor loads, provide UL Class RK1 single element, fast-acting type fuses.
b. For motor, welder, and transformer loads, provide UL Class RK5 dual element, time-delay type fuses.
2. Acceptable Manufacturers:
a. Cooper Bussman
1) UL Class RK1: Limitron®.
2) UL Class RK5: Fusetron®.
b. Gould-Shawmut.
c. Or Approved Equal.

2.3 SOURCE QUALITY CONTROL

A. Testing Agency/Quality Verification:
1. Perform the standard low-voltage enclosed switch factory tests specified in NEMA KS l and UL 98.
2. Submit evidence of testing agency/quality verification, listing, and labeling for each product with the submitted product data either by providing a printed mark on the data or by attaching a separate listing card.
a. For items without such evidence, provide a written statement from the product manufacturer that indicates why it does not have quality assurance verification.
b. Such statements are subject to the approval of Metro North Railroad .

PART 3 - EXECUTION

3.1 INSTALLERS

A. Install the work of this Section only under the supervision of licensed electricians.

3.2 PREPARATION

A. Provide a prime and finish coat of paint for painted surfaces that will be covered by items provided under this Section.

B. Prior to painting operations, mask all nameplates, plastic parts, push buttons, operating shafts, and other items not to be painted.

C. Ensure that all indoor areas to receive the items provided under this Section are enclosed from the weather.

3.3 INSTALLATION

A. Install disconnect switches and hazardous location switches in accordance with the switch manufacturer's instructions.
   1. Mount enclosures on 1/4-inch (6mm) spacers or U-channel supports to provide a space between enclosures and mounting surfaces.
      a. Provide supports as specified in Section 26 05 28, Hangers and Supports for Electrical Systems.
   2. Set the top of enclosures 6'-6" above the finished floor or grade unless otherwise indicated or specified.

B. Install the switch's conduit and wiring:
   1. Punch holes in the disconnect switch enclosures for conduit entries, except use the pre-tapped hubs and integral bushings for attaching conduit to hazardous location switch enclosures.
      a. Connect conduit to disconnect switch enclosures with water-tight hubs except as follows:
         1) In dry locations, either the watertight hubs or two locknuts and bushings may be used to connect conduits to the disconnect switch enclosure.
         2) In damp locations, either the watertight hubs or a sealing locknut, interior locknut, and grounding bushing may be used on the bottom of the enclosures.
      b. In wet and/or hazardous areas, install a conduit drain-fitting in a hole punched in the bottom of the enclosure, and install a conduit breather fitting in a hole punched in the top of the enclosure.
   2. Remove or protect components installed in the interior of enclosures during wire pulling.
   3. Use lugs provided by or approved by the disconnect switch manufacturer to connect wiring to the disconnect switch's line and load terminals in conformance with Section 26 05 19, Low Voltage Electrical Power Conductors and Cables.

C. Identify low-voltage enclosed switches in accordance with Section 26 05 53, Identification for Electrical Systems.

3.4 FIELD QUALITY CONTROL

A. Site Testing:
   1. Prior to energizing the low-voltage enclosed switches:
      a. Perform insulation testing and ensure that all load-side wiring is clear of shorts in accordance with the requirements of Section 26 05 53, Acceptance Testing for Electrical Systems.
   2. Final testing after energizing the circuit breakers:
      a. Perform the thermographic test in conformity with Section 26 05 53, Acceptance Testing for Electrical Systems, and record the circuit parameters.

3.5 PROTECTION

A. Protect the items provided under this Section during the performance of work provided under other Sections, especially during welding and cutting operations.

B. Protect the low-voltage enclosed switches against overloads, short-circuits, and improper operation.
   1. Pad-lock the low-voltage enclosed switches in the off position when work is being done on downstream circuits.

END OF SECTION

SECTION 26 41 13 - LIGHTNING PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the lightning protection system on structures less than 75 Feet in height.

B. Provide a complete Lightning Protection System in accordance with these specifications and all applicable codes.

1.2 CODE AND STANDARDS REQUIREMENTS

A. Underwriter's Laboratories, Inc. Subject 96A Eleventh Edition (2001) or latest.

B. National Fire Protection Association NFPA No. 780 (2008) or latest.

C. Transient Voltage Surge Suppression, UL1449 Third Edition (2009) or latest.

1.3 STANDARD PRODUCTS

A. The system provided under this specification shall be the product of a single manufacturer regularly engaged in the production of Lightning Protection Systems, shall be the manufacturer's latest designs, and shall be listed by Underwriters Laboratories Standard for Lightning Protection Components – UL96, Fifth Edition (2005) or latest.

B. Contractor shall acquire the services of the manufacturer's Engineering Department for Coordination and Design of this system.

1.4 SYSTEM DESCRIPTION

A. The exterior lightning protection system shall consist of an air termination system (interception points), ground termination system (dissipation points), and a down conductor system (low impedance conductors interconnecting the interception and dissipation points).

B. The interior lightning protection system shall consist of ground potential loop conductors, bonding conductors and devices required to achieve an equalization of earth (ground) potential between the various grounded metal objects and systems within the building.

1.5 SUPPLEMENTAL SUBMITTALS

A. Contractor shall provide detailed shop drawings to show locations of system components including connections to other building systems and components. These Drawings shall be submitted for approval prior to the start of any work, and shall be coordinated with applicable trades.

B. Provide complete list of materials and catalog data

C. Test Report

D. Certificate of compliance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. East Coast Lightning Equipment, Inc, Winsted, CT, 860-379-9072

B. Harger Lightning Protection, Inc., Libertyville, IL, 800-842-7437

C. ERICO Manufacturing, Solon, OH, 800-777-1230

2.2 INSTALLERS

A. Approved Lightning Protection, Co. Inc., 65 Mahan Street West Babylon, NY 11704, (631) 643-6327

B. Associated Lightning Rod Co. Inc., Millerton, NY 12546, 518-789-4603

2.3 MATERIALS

A. All materials shall be of either copper/brass or aluminum materials.

B. Materials shall be sized in accordance with the material requirements of NFPA780 and UL96A. Class I materials shall be used for systems on structures not exceeding 75 feet in height and Class II materials shall be used for systems on structures exceeding 75 feet above grade.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Air Terminals

1. Air terminals shall be provided so as to enclose the entire building within a zone of protection. Air terminals shall project a minimum of ten inches above the area protected and shall be located at intervals not exceeding 20'-0" along ridges and around the perimeter of flat or gently sloping roofs. Flat or gently sloping roofs exceeding 50'-0" in width shall be protected with additional air terminals located at intervals not exceeding 50'-0" in the flat or gently sloping area. Air terminals shall be located within 18 inches of roof edges and outside corners of protected areas. Air terminal spacings exceeding these dimensions are permitted so long as the area protected lies within a zone of protection.
2. Air terminals shall be installed for stacks, flues, mechanical equipment, and other objects not located within a zone of protection. Non-metallic objects or metal objects having a metal thickness of less than 3/16" require the installation of air terminals and required conductors. Objects having a metal thickness 3/16" or greater shall be connected to the lightning protection system per standard requirements using main size conductor and connector fittings having 8 square inches of surface contact area.
3. Air terminal mounting bases shall be of cast construction and securely fastened to the structure in accordance with standard requirements

B. Conductors

1. Main conductors shall be sized in accordance with the material requirements above and shall provide a two-way path from each air terminal horizontally or downward to connections with ground terminals. Conductors shall be free of excessive splices and sharp bends. No bend of a conductor shall form an included angle of less than 90° nor have a radius of bend of less than 8". Conductors shall be secured to the structure at intervals not exceeding 3'-0".

2. Down conductors shall be aluminum and shall be concealed in the exterior wall construction. Down conductors shall be spaced at intervals averaging not more than 100' around the perimeter of the structure. In no case shall a structure have fewer than two down conductors.

3. In the case of structural steel frame construction, down conductors shall be omitted and roof conductors shall be connected to the structural steel frame at intervals averaging not more than 60' around the perimeter of the structure. Connections to the steel frame shall be made with bonding plates having 8 square inches of contact or by exothermic weld connections at both the top and bottom of the column.

C. Roof Penetrations

D. Roof penetrations required for down conductors or for connections to structural steel framework shall be made using thru-roof assemblies via 1” PVC conduit sleeves that are rated for exterior use, with solid bars and appropriate roof flashings. Conductors shall not pass directly through the roof. Roof flashings compatible with the roofing system shall be provided by the roofing contractor.

E. Common Grounding

1. Common grounding of all ground mediums within the building shall be ensured by interconnecting the lightning protection system with main size conductors and fittings to the cold water ground.

    a. Metal bodies located within 6’ of the lightning protection system shall be bonded to the system as per UL 96A standard.

2. Ground Terminations

    a. Ground terminations shall be provided for each down conductor and shall consist of 3/4"x 10'-0" (minimum) copper-clad ground rod. The down conductor shall be connected to the ground rod using a bronze ground rod clamp having at least 1½” of contact between the rod and the conductor, measured parallel to the axis of the rod, or by an exothermic weld connection. Ground rods shall be located 2'-6” below grade, 2' from the foundation wall and shall extend a minimum of 10' vertically into the earth.

    b. Conductors from the grounded connections to the ground termination shall be Class II copper lightning conductors.

F. Surge Protection

1. Secondary surge protection devices meeting UL 1449 requirements for Master Label Lighting Systems shall be provided on each electric and telephone service entrance, Cable TV Service and all antenna lead-in cables.

G. Test and Acceptance

1. Contractor shall perform continuity, resistance and additional tests as recommended by the manufacturer, and or requested by the Authority.

H. Certification

1. Upon completion of the installation the Contractor shall furnish the Master Label Certificate issued by Underwriters Laboratories, Inc. for this system.

END OF SECTION

SECTION 26 43 13 - SURGE PROTECTIVE DEVICES (SPD)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: The work specified in this Section consists of materials for furnishing, installing, connecting, energizing, testing, cleaning and protecting enclosed surge protective devices.

B. Related Sections:
1. Section 26 05 00 – Common Work Results for Electrical
2. Section 26 05 26 - Grounding and Bonding
3. Section 26 05 28 - Hangers and Supports for Electrical Systems
4. Section 26 05 63 - Acceptance Testing for Electrical Systems
5. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
6. Section 26 05 33.13 - Conduit for Electrical Systems

1.2 REFERENCES

A. American National Standards Institute/Underwriters Laboratories (ANSI/UL):
1. ANSI/UL 1449 Surge Protective Devices (Third Edition)
2. UL 1283 Electromagnetic Interference Filters

B. National Fire Protection Association (NFPA):
1. NFPA 70 National Electrical Code (NEC) Article 285.

C. Institute of Electrical and Electronic Engineers/American National Standards Institute (IEEE/ANSI):

1.	ANSI/IEEE C62.41.1-2002	IEEE Guide on the Surge Environment in Low Voltage (1000 V and Less) AC Power Circuits
2.	ANSI/IEEE C62.41.2-2002	IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits.
3.	ANSI/IEEE C62.41.2-2002	IEEE Recommended Practice on Surge Testing Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits.

1.3 SUBMITTALS

A. Make all submittals in accordance with Section 26 05 00.

B. Testing Agency/Quality Verification: Provide with all product data evidence of testing agency/quality verification, listing, and labeling either by printed mark on the data or by a separate listing card. Provide from product manufacturers a written statement indicating why an

item does not have a quality assurance verification. Such statements are subject to the approval of Metro North Railroad.

C. Product Data and Catalog Cuts: Provide product data within 60 days of contract award for all products provided.

D. Shop Drawings: Submit shop drawings for all Surge Protective Devices.

E. Provide manufacturer's instructions for all Surge Protective Devices.

F. Project Record Documents: Record actual installed elevation and locations of equipment and wiring on record contract and shop drawings as specified in Section 26 05 00.

G. Project Closeout: Include record drawings, shop drawings and product data with Installation and Maintenance Manuals and submit at project closeout in accordance with Section 26 05 00.

1.4 QUALITY ASSURANCE

A. Conform all quality control work to Section 26 05 00.

B. Provide products that are listed and labeled by Underwriters Laboratory, approved by Factory Mutual or certified as meeting the standards of United Laboratories by the Electrical Testing Laboratory for the location installed in and the application intended unless products meeting the requirements of these testing laboratories are not available or unless standards do not exist for the products.

C. Unless products meeting the requirements of nationally recognized testing laboratories are not readily available for a category of products, provide products that are:
   1. Listed and labeled by Underwriters Laboratory.
   2. Approved by Factory Mutual.
   3. Certified as meeting the standards of Underwriters Laboratory by the Electrical Testing Laboratory.

D. Conform all work to regulatory requirements of all state, local, and national governing codes and requirements, NFPA 70, National Electrical Code, and the requirements of Section 26 05 00.

E. Installer Qualifications: Firm specializing in installing work of this Section with minimum three years documented experience.

F. Install work by or under supervision of licensed electricians.

1.5 DELIVERY, STORAGE AND HANDLING

A. Protect items from damage during delivery, storage and handling in accordance with Section 26 05 00 and as detailed below.

B. Store all products indoors in heated warehouses on blocking or pallets.

1.6 WARRANTY

A. SPD shall have a ten-year warranty. Warranty shall be the responsibility of the electrical distribution equipment manufacturer and shall be supported by their respective field service division.

PART 2 - PRODUCTS

2.1 SURGE PROTECTIVE DEVICES EQUIPMENT

A. General Requirements:
1. Provide only products satisfying the applicable requirements for testing and reporting as established herein. Devices proposed for use on this project shall be tested in accordance with ANSI/UL 1449 Third Edition, as prescribed by ANSI/IEEE C62.45 - 2002. The voltage protection rating (VPR) or "clamping" voltages shall be recorded for all applicable mode of operation and for each of the test standard waveforms referenced. The results of these tests shall be submitted to Metro North Railroad with the product data sheets as outlined under in this Section.
2. Products furnished for use on this project are to incorporate protective elements in all applicable modes, unless specifically indicated otherwise.
3. Install SPD equipment where so indicated on the Drawings. Voltage class and type of unit to be compatible with distribution voltage being protected.

2.2 Integral Surge Protective Devices:
1. SPD shall be Listed in accordance with ANSI/UL 1449 Third Edition, Standard for Safety, Surge Protective Devices.
2. All SPDs installed on the line side of the service entrance disconnect shall be a Type 1 SPDs. All SPDs installed on the load side of the service entrance disconnect shall be a Type 1 or 2 SPD.
3. SPD shall be modular in design. Each protection element shall be a user replaceable surge current diversion Thermally Protected unimodule (MOV based). Each surge current diversion module shall have a short circuit current rating (SCCR) of 200 kA.. Each surge current diversion module shall include solid state status indicator lights.
4. SPD shall provide redundant surge current diversion modules for each mode of Protection. Modes of Protection shall be L-N, L-G, N-G in WYE systems, and L- L, L-G in DELTA systems.
5. SPD shall incorporate copper bus bars for the surge current path. Small gauge round wiring or plug-in connections shall not be used in the path for surge current diversion. Surge current diversion modules shall use bolted connections to the bus bars for reliable low impedance connections.
6. Nominal Discharge Current (In) – SPD applied to the distribution system shall have a minimum 20kA.
7. 320kA and 250 kA SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41.2 - 2002 Category C (Type 1) environments.
8. SPD shall meet or exceed the following criteria:
   a. Minimum surge current rating per mode shall be:
      1) L-N 120 kA
      2) L-G 120 kA

3) N-G 120 kA
4) Per phase 250 kA

9. UL 1449 Third Edition Listed voltage protection ratings (VPRs) shall not exceed the following:

VOLTAGE	L-N	L-G	N-G	L-L
480 DELTA	XXX	1800V	XXX	1800V
AND/OR				
480Y/277	1200V	1200V	1200V	2000V
AND/OR				
208Y/120	700V	700V	700V	1200V
AND/OR				
240/120	700V	700V	700V	1200V

10. SPD shall be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage for 480Y/277 V and not less than 125% of nominal RMS voltage for 208Y/120 V systems.
11. SPD shall be equipped with onboard visual LED lights and audible diagnostic monitoring. Red and green LED indicator lights shall provide full time visual diagnostic monitoring of the operational status of each phase as well as each surge current diversion module. Audible diagnostic monitoring shall be by way of audible alarm. This alarm shall activate upon a fault condition. An alarm on/off switch shall be provided to silence the alarm. An alarm push to test switch shall be provided. The diagnostic monitoring circuits shall continually monitor the operational status of the surge current diversion modules. No other test equipment shall be required for SPD monitoring or testing before or after installation.
12. SPD shall be connected to the power bus through a dedicated circuit breaker or disconnect.
13. SPD shall include Form C dry contacts to monitor the performance of each phase and provide a summary alarm.
14. SPD shall include an event surge counter. The counter shall be equipped with a manual reset and a battery or flash memory to retain memory upon loss of AC power. The surge counter display and reset switch shall be mounted on the front of the SPD enclosure.
15. Acceptable Manufacturers:
    a. Eaton Electric
    b. Square D Company.
    c. General Electric.
    d. Siemens Industry for LV Power Distribution.
    e. Advanced Protection Technologies Inc.
    f. LEA International
    g. Or Approved Equal.

2.3 MATERIALS

A. Grounding Materials: Conform to Section 26 05 26

B. Steel Supports and Anchors: Conform to Section 26 05 28

C. Wiring, External to Equipment and Connectors: Conform to Section 26 05 19

D. Conduit Materials: Conform to Section 26 05 33.13

PART 3 - EXECUTION

3.1 PREPARATION

A. Painted surfaces, which will be covered by items of this Section, shall have a prime and finish coat of paint.

B. Ensure that all indoor areas are enclosed from the weather.

3.2 INSTALLATION

A. Space enclosures out from surfaces mounted on 1/4-inch spacers or u-channel supports. Provide supports as specified in Section 26 05 28.

B. Install all Surge Protective Devices in accordance with the manufacturer's instructions.

C. Ground all Surge Protective Devices in accordance with Section 26 05 26, and the manufacturer's instructions using wire as specified in Section 26 05 19, of size No. 6 AWG or larger if otherwise indicated, recommended, or specified.

D. Connect all Surge Protective Devices in accordance with Section 26 05 19 and the manufacturer's instructions. For service, Surge Protective Devices use No. 4 AWG or larger if otherwise indicated or recommended. For branch circuit Surge Protective Devices use No. 6 AWG or larger if otherwise indicated on the drawings, recommended, or specified. For instrument, communication, and data and telephone unit protectors use wire sized the same as the circuit, data-line that the Surge Protective Devices is connected to or larger if otherwise indicated, recommended, or specified.

E. Install all SPD's with the straightest & shortest practical lead length, less than 24 inches.

F. Interface with other work:
   1. Connect conduits to enclosure with watertight hubs except in damp locations on the bottom of enclosures. A sealing locknut may be used in place of watertight hubs and in dry locations two locknuts and bushings may be used.
   2. Connect wiring to line and load terminals with lugs provided or approved by manufacturer in conformance with Section 26 05 19. Remove interior or protect interior components during wire pulling.
   3. Connect to conduit systems in conformance with Section 26 05 33.13.
   4. Connect to wiring systems in conformance with Section 26 05 19.

3.3 FIELD QUALITY CONTROL

A. Site Testing:
   1. Prior to energizing:
      a. Have insulation testing and setting made in conformance of Section 26 05 63.
      b. Ensure that all load-side wiring is clear of shorts and has received and passed the insulation tests of Section 26 05 63.

c. Energize in presence Metro North Railroad and close circuit breaker for first time in presence Metro North Railroad.
d. Final testing after energizing:
   1) Perform thermographic test and record circuit parameters in conformity with Section 26 05 63.

3.4 PROTECTION

A. During painting mask all nameplates, all plastic parts, pushbuttons, operating shafts and all items not to be painted.

B. Protect all items during work of other trades including welding and cutting.

C. Protect Surge Protective Devices against short circuits and improper operation.

END OF SECTION

SECTION 26 50 00 - LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Requirements for general and emergency egress lighting equipment, components, and related installation.

B. Related Sections:
   1. Division 1 Sections
   2. Section 26 05 26 - Grounding and Bonding.
   3. Section 26 05 28 - Hangers and Supports for Electrical Systems.
   4. Section 26 05 63 - Acceptance Testing for Electrical Systems.
   5. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables.
   6. Section 26 05 33.13 - Conduit for Electrical Systems.
   7. Section 26 27 26 - Wiring Devices.

1.2 REFERENCES

A. The Aluminum Association, Inc. (AA):
   1. DAF-45, Designation System for Aluminum Finishes.

B. American National Standards Institute (ANSI).
   1. ANSI C81.64, Guidelines and General Information for Electrical Lamp Bases, Lampholders and Gauges.
   2. ANSI C81.64a, Electric Lamp Bases and Holders - Guidelines and General Information for Electrical Lamp Bases, Lampholders and Gauges.
   3. ANSI C82.1, Specifications for Fluorescent Lamp Ballasts.
   4. ANSI C82.1d, Electric Lamps – Paragraphs 5.3.3 and 5.5.3: Compact Fluorescent Lamp Ballasts.
   5. ANSI C82.1e, Fluorescent Lamps – Specifications for Fluorescent Lamp Ballasts.
   6. ANSI C82.2, Fluorescent Lamp Ballasts, Methods of Measurement of.
   7. ANSI C82.2a, Fluorescent Lamps - Methods of Measurement.
   8. ANSI C82.3, Fluorescent Lamp Reference Ballasts, Specifications for.
   9. ANSI C82.4, Ballasts - for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).
   10. ANSI C82.5, Reference Ballasts - High-Intensity-Discharge and Low-Pressure Sodium Lamps.
   11. ANSI C82.6, Reference Ballasts for High-Intensity-Discharge Lamps – Methods of Measurement.
   12. ANSI C82.6a, Reference Ballasts for High-Intensity-Discharge Lamps – Methods of Measurement.
   13. ANSI C82.8, Lamp Transformers – Incandescent Filament Lamp Transformers - Constant Current (Series) Supply Type.

14. ANSI C82.9, High-Intensity-Discharge and Low-Pressure Sodium Lamps, Ballasts and Transformers - Definitions.
15. ANSI C82.9b, Electric Lamp Ballasts - High-Intensity-Discharge and Low- Pressure Sodium Lamps, Ballasts and Transformers - Definitions.
16. ANSI C82.11, High-Frequency Fluorescent Lamp Ballasts.
17. ANSI C82.11a, Lamp Ballasts - Specifications for High-Frequency Fluorescent Lamp Ballasts - Distance to Grounded Starting Aid.
18. ANSI C82.11b, Lamp Ballasts - Specifications for High-Frequency Fluorescent Lamp Ballasts - Line Transient Requirements.
19. ANSI C82.11c, Normative Annex A: Specifications for Low Voltage Control Interface for Controllable Ballasts and Informative Index B: Specification for Nomenclature for Controllable Ballasts.
20. ANSI C82.12, Lamp Ballasts - Ballasted Adaptors.
21. ANSI C82.13, Fluorescent Lamps and Ballasts - Definitions.
22. ANSI C82.77, Lamp Ballasts - Harmonic Emission Limits - Related Power Quality Requirements for Lighting Equipment.

C. Federal Communications Commission (FCC)
1. FCC 47 CFR Part 15, Federal Code of Regulation (CFR) Testing Standard for Electronic Equipment

D. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
1. IEEE C62.41; Recommended Practice on Characterization of Surges in Low- Voltage (1000 V and Less) AC Power Circuits.

E. Illuminating Society of North America (IESNA)
1. IESNA LM-79, Electrical and Photometric Measurements of Solid-State Lighting Products
2. IESNA LM-80, Approved Method for Measuring Lumen Maintenance of LED Lighting Sources
3. IESNA TM-15, Luminaire Classification System for Outdoor Luminaires.

F. National Electrical Manufacturers Association (NEMA):
1. NEMA 250, Enclosures for Electrical Equipment.
2. NEMA SSL 3, High Power White LED Binning for General Illumination

G. National Fire Protection Association (NFPA):
1. NFPA 70, National Electrical Code (NEC).

H. Underwriter’s Laboratories, Inc. (UL):
1. UL 496, Standard for Safety of Edison-Base Lampholders.
2. UL 542, Standard for Safety of Lampholders, Starters, and Starter Holders for Fluorescent Lamps
3. UL 924, Standard for Safety of Emergency Lighting and Power Equipment.
4. UL 935, Standard for Safety of Fluorescent Lamp Ballasts.
5. UL 1029, Standard for Safety of High-Intensity-Discharge Lamp Ballasts.
6. UL 1574, Standard for Safety of Track Lighting Systems.
7. UL 1598, Standard for Safety of Luminaires.
8. UL 1598B, Standard for Luminaire Reflector Kits for Installation on Previously Installed Fluorescent Luminaires.
9. UL 1993, Standard for Safety of Self-Ballasted Lamps and Lamp Adapters.

10. UL 1994, Standard for Safety of Low Level Path marking and Lighting Systems
11. UL 2108, Standard of Safety of Low Voltage Lighting Systems.

I. U. S. Government:
1. Occupational Safety and Health Administration (OSHA):
   a. 29 CFR 1910 Occupational Health and Safety Standards.
   b. 29 CFR 1926 Safety and Health Regulations for Construction.
2. Federal Communications Commission (FCC):
   a. 47 CFR 18 Industrial, Scientific, and Medical Equipment.
3. Department of Energy (DOE):
   a. The Energy Policy of 2005, Public Law 109-58.

1.3 DEFINITIONS

A. LED – An acronym for "Light-Emitting Diode" used to indicate a semiconductor light source.

1.4 DESIGN REQUIREMENTS

A. Design Criteria:
1. The Lighting Level Criteria on the Contract Drawings and the Performance Design Criteria (PDC) constitutes the basis of the lighting design for this Contract, but may not indicate the special design details required.
   a. The Lighting Fixture Schedule includes the lighting fixture descriptions, fixture manufacturers, and corresponding model numbers and is for estimating purposes only.
2. Provide lighting fixtures meeting the requirements of the basis of the lighting design for this Contract, and which have the special details specified in this Section.
   a. Submit Shop Drawings and manufacturer's installation instructions to show details of assemblies and sub-assemblies, and specially-fabricated supporting and fastening devices.
   b. Submit bills of material for the fixtures and their appurtenances.
      1) Reference the bills of material to the Shop Drawings.
      2) Provide bills of material consisting of itemized lists of the parts required (i.e. ballast capacitor igniter, and other similar item descriptions).
      3) Identify each part with a part number and/or manufacturer number.
   c. Provide fixtures for exterior installation that are designed to be completely waterproof.
   d. Provide luminaire brackets designed to be compatible with configuration of the luminaire.

B. Provide the following:
1. The manufacturer's catalog cuts indicating the type, design, dimensions, mounting arrangement, and other industry standard lighting fixture information.
   a. Describe the lighting fixtures, exit signs, emergency battery units, and appurtenances.
2. Manufacturer's photometric data, distribution curves, isolux charts, glare factor data, and coefficient of utilization.

3. Complete photometric data for the fixture, including optical performance, completed by an independent testing laboratory developed according to the standards of the Illuminating Engineering Society of North America as follows:
   a. For direct, direct/indirect and indirect lights used for general illumination:
      1) Coefficients of utilization.
      2) Candlepower data, presented graphically and numerically, in 5 degree increments (5 degree, 10 degree, 15 degree, etc.). Data developed for up and down quadrants of normal, parallel, and at 22-1/2 degree, 45 degree, 67-1/2 degree planes to lamp(s). If light output is asymmetric, provide additional planes as required to complete report.
      3) Zonal lumens stated numerically in 10 degree increments (5 degree, 15 degree, etc.) as above.
      4) Average luminaire luminance calculated in the lengthwise, crosswise, and 45 degree vertical planes.
   b. For exterior roadway, area, or floodlighting luminaires, photometric data shall include isocandela charts, coefficient of utilization, IES roadway distribution classification (where applicable), and isofootcandle plots for the specific mounting heights, lamps, and conditions of the project.
4. Point-by-point lighting calculations showing the uniformity of light on the horizontal work plane in areas where substitutions are proposed. The substituted fixture shall be equivalent to the named fixture, including lighting level, Visual Comfort Performance (VCP), glare, Equivalent Sphere Illumination, energy usage and aesthetics.
   a. Prior to executing the point-by-point lighting calculations, request individual light loss factors, as defined in Chapter 9 of the IESNA lighting handbook, from the Engineer for input into the point-by-point lighting calculation.
   b. For each substituted light fixture provide photometric data and related information in IESNA standard file format for electronic transfer on a CD ROM.

C. Submit a complete lamp inventory for approval, including specific lamp type, manufacturer, and all appropriate lamp criteria including but not limited to: life, initial and mean lumens, beam spread, candlepower, lamp envelope, base type, color temperature, and color rendering index.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. The execution of work of this Section must satisfy the applicable requirements of the latest edition of NFPA 70 (NEC), the National Occupational Safety and Health Act as embodied in 29 CFR 1910 and 29 CFR 1926, and regulations of local jurisdictional authorities.
   2. Comply with the requirements of the Energy Policy Act (EPACT) of 2005 and the applicable version of the International Energy Conservation Code.

B. Certifications:
   1. All products must be Underwriters' Laboratories (UL) listed; and each fixture, Emergency Battery Unit, and exit sign must bear the UL label.
      a. The UL standards appropriate for the products specified are listed in Paragraph 1.02.E.
   2. Fixtures that are to be installed in areas subject to the weather must be UL listed as "Enclosed and gasketed suitable for wet locations".
   3. Provide UL Listed LED lighting fixture drivers

1.6 SUBMITTALS

A. Submit the following information for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
   1. Product Data:
      a. Manufacturer's catalog cuts.
         1) Lighting fixtures catalog cuts
         2) Driver s information and catalog cuts.
         3) Lamp catalog sheets of each lamp type for approval, including specific lamp type, manufacturer, and all appropriate lamp criteria including but not limited to: life, initial and mean lumens, beam spread, candlepower, lamp envelope, base type, color temperature, and color rendering index
      b. Manufacturer's photometric data, distribution curves, isolux charts, glare factor data, and coefficients of utilization for each lighting fixture type.
   2. Shop Drawings:
      a. Shop Drawings.
      b. Bills of material.
   3. Quality Assurance/Quality Control Submittals:
      a. Design Data:
         1) Calculations demonstrating that the proposed fixtures meet the design criteria.
      b. Certificates:
         1) Proof that equipment furnished has the required Underwriters' Laboratories (UL) listing.
         2) Drivers certifications.
      c. Manufacturer's Instructions:
         1) Manufacturer's installation instructions.

1.7 EXTRA MATERIALS

A. Lamps:
   1. For the lighting fixtures furnished, provide an additional 10 percent of each lamp type specified over the quantity required to initially lamp the fixtures furnished.

B. Maintenance Tools:
   1. Provide two each of the special maintenance tools as may be necessary for re- lamping fixtures and for fixture maintenance.

C. As the equipment for which the extra materials can be used is substantially completed, turn the extra materials for that equipment over to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Conduit and Raceway:
   1. Provide electrical conduit and raceway in accordance with the requirements of Section 26 05 33.13, or as indicated and as appropriate for the application per NFPA 70.

B. Control Devices:
1. Provide electrical lighting control devices in accordance with the requirements of Section 26 27 26.

C. Fixture Support Devices and Fasteners:
1. In addition to the supporting devices and fasteners specified in Section 26 05 28, provide suspension accessories, canopies, casing, sockets, holders, reflectors, plaster frames, recessing boxes, and similar items required to support the lighting equipment and luminaries as specified or indicated.

D. Wire and Cable:
1. Provide electrical wire and cable in accordance with the requirements of Section 26 05 19.

2.2 MANUFACTURED UNITS

A. Light Fixtures:
1. Provide those fixtures indicated on the Lighting Fixture Schedule on the Contract Drawings or approved substitutions.
a. The manufacturers' fixture descriptions and corresponding fixture model numbers are also listed in the Lighting Fixture Schedule on drawings.
b. Additional manufacturers who can provide products comparable to those provided by the manufacturers listed and whose products the Contractor proposes to use for this Contract must first be submitted to and receive the approval of the Engineer prior to being substituted for the listed manufacturers.
2. Fixture Grounding Device and Conductor:
a. Provide the housing of each fixture with a separate, factory-installed grounding device and ground conductor.
3. Exterior Fixtures:
a. Factory-equip fixtures intended for exterior installation with waterproof gaskets and anodized aluminum frames unless indicated otherwise on the Contract Drawings.
1) Provide outlet boxes, neoprene gaskets, and stainless steel hardware to render the exterior fixture installation waterproof.
b. Finish:
1) Provide fixtures for exterior installation with a finish free of scratches and other surface blemishes.
c. Brackets:
1) Provide brackets of the type and style indicated or scheduled on the Contract Drawings and color matched to the light fixture.

B. LED Lighting Fixtures (excluding LED exit signs)
1. Color temperature of any substituted fixture shall be within 10% of the specified value shown on the drawings.
2. Power consumption of any substituted fixture shall not exceed the specified value shown on the drawings by more than 10%. If a substituted fixture is submitted and approved at an increased wattage 9within 10% of the specified wattage), any power system modifications necessary to accommodate the fixtures will be the responsibility of the Contractor (i.e. increased wire sizes, increased circuit breaker size, additional circuits/breakers, etc.)

3. LED Lumen Efficacy (Lumens/Watt) of a substituted fixture shall not be less than the specified fixture by more than 10%.
4. Characteristics of substituted fixtures shall have the same features as the specified LED fixtures (i.e. redundant drivers, driver protection, etc.) whether specifically noted on the lighting fixture schedule or not.
5. Drivers shall not exceed 350mA unless specifically noted otherwise on the lighting fixture schedule. Drivers shall have a Class A sound rating.
6. LED Light fixtures shall have a minimum expected life of 50,000 hours. The aforementioned life rating must be conducted with a 40 degrees calcium ambient temperature.
7. Power Factor: The LED fixture shall have a power factor of 0.90 or greater.
8. Total Harmonic Distortion induced into the AC power line by the luminaire shall not exceed 20 percent.
9. Surge Suppression: The LED fixture on-board circuitry shall include surge protective devices to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The SPD shall protect the luminaire from damage and failure for common mode transient peak voltages up to 10 kV (minimum) and transient peak currents up to 5 kA (minimum). SPD shall conform to UL 1449 depending of the components used in the design. SPD performance shall be tested per the procedures in ANSI/IEEE C62.41-1992 (or current edition) for category A (standard). The SPD shall fail in such a way as the Luminaire will no longer operate. The SPD shall be field replaceable.
10. Operational Performance: the LED circuitry shall prevent visible flicker.
11. Thermal Management: The thermal management (of the heat generated by the LED's) shall be of sufficient capacity to assure the proper operation of the luminaire over the expected useful life. Thermal management shall be by passive design – the use of fans or other mechanical devised is not allowed.

C. Lighting Contactors:
   1. Provide contactors to meet the design criteria, with the number of poles per contactor and the amperage and load voltage ratings indicated.
      a. For all types of lamp loads, provide single or multiple contact, continuous duty, electrically or mechanically held type contactors suited for non- inductive loads.
      b. Provide contactors of the flush dead back design with arc shields and barriers to prevent pole-to-pole flashover.
      c. Provide contactors with all parts accessible for inspection and maintenance.
         1) Provide contacts that are readily replaceable from the front of their panels.
   2. Interrupting Capacity:
      a. Provide contactors with an interrupting capacity of 150 percent of their rating with no derating for high inrush loads.
   3. Enclosure:
      a. Provide a contactor enclosure designed to meet the requirements for NEMA 12 surface type enclosures as specified in NEMA 250 unless indicated otherwise on the Contract Drawings.
      b. Provide enclosures complete, and with provisions for padlocking.
   4. Acceptable Manufactures
      a. Square D www.schneider-electric.com
      b. Eaton Electric www.eatonelectric.com
      c. Siemens www.siemens.com
      d. General Electric www.geindustrial.com
      e. Allen-Bradley www.ab.com

f. Or Approved equal.

D. Photocontrols:
1. Provide cadmium sulphide, hermetically sealed photocells suitable for remote mounting.
   a. For individual luminaries, provide plug-in, twist-to-lock-type photoelectric controls with voltage characteristics compatible with the luminaire.
   b. For a group of luminaires and/or lighting fixtures, provide conduit mounted type photoelectric controls.
2. Provide fully temperature compensated photo controls designed with a 15 second time delay to prevent false switching.
3. Acceptable Manufacturers:
   a. Tork www.torkusa.com
   b. Tyco Electronics www.te.com
   c. Paragon Electrical Products www.paragontimecontrols.com
   d. Or Approved equal.

E. Luminaire Brackets:
1. Provide luminaire brackets color matched to light fixture.
2. Provide luminaire brackets fabricated to be compatible with the configuration of the luminaire.

F. Luminaire Poles
1. Comply with AASHTO LTS-3 for pole or other support structures, brackets, arms, appurtenances, base, and anchorage and foundation.
2. Wind-Load Strength of Total Support Assembly: Adequate to carry support assembly plus luminaires at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of 70 mph with a gust factor of 1.3. Support assembly includes pole or other support structures, brackets, arms, appurtenances, base, and anchorage and foundation.
3. Strength Analysis: For each pole type and luminaire combination, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.
4. Aluminum Poles: Fabricated from seamless, extruded structural tube complying with ASTM B 429, 6063-T6 alloy with access handhole in pole wall.
5. Metal Pole Brackets: Match pole metal. Provide cantilever brackets without underbrace, in sizes and styles indicated, with straight tubular end section to accommodate luminaire.
6. Finish: Match finish of pole/support structure for arm, bracket, and tenon mount materials.

G. Luminaire Pole Foundations
1. Pole/Support Structure Bases: Anchor type with hold-down or anchor bolts, leveling nuts, and bolt covers.
2. Embedded type with underground conduit/cable entry.
3. Comply with Specification Section 03 30 00- Cast-in-Place Concrete.
4. Design Strength: 4000-psig (20.7-MPa), 28-day compressive strength.

H. Boxes, Gaskets, Hardware, and Support Devices:
1. Provide outlet boxes, neoprene gaskets, and stainless steel hardware to render the installation of the lighting waterproof.
   a. Provide waterproof splice kits where required as specified in Section 26 05 19.

2. Supply pendant stems, special mounting supports and hardware, and miscellaneous materials and incidentals required to install the lighting and emergency battery unit products in place.
3. Provide neoprene spacers for maintaining clearance between lighting and emergency battery unit products and concrete, mortar, and other masonry surfaces.

2.3 EXAMINATION

A. Prior to ordering flush mounted or lay-in type lighting fixtures, verify their locations and clearances, and coordinate with other construction work to verify that the fixtures will fit without interferences.

B. Prior to beginning installation of the lighting fixtures and accessories, verify that all other work affecting the installation of the lighting fixtures and accessories is complete to the extent that the light fixtures may be installed over substrates or incorporated into integrated systems without adversely affecting the lighting or other construction.

2.4 INSTALLATION

A. Assemble lighting fixtures if required; and install and wire the lighting fixtures, supports, brackets, and accessories at the locations and mounting heights indicated on the Contract Drawings.
1. Wire the lighting fixtures and accessories as specified in Section 26 05 19.
2. Ground the lighting fixtures in accordance with the requirements of Article 410 of NFPA 70 (NEC) and Section 26 05 26.
    a. Use the fixture grounding device to connect a separate grounding conductor in compliance with requirements specified in Section 26 05 26.
3. Install all photoelectric controls facing north for proper operation.

B. Recessed Fixture Installation:
1. Support recessed fixtures on the structural elements.
    a. Use the mounting yokes furnished with the fixtures and, where required, the supports specified in Section 26 05 28.
2. If light leaks through gaps between the recessed fixture trim and the adjacent surface, install suitable sealing gaskets.

C. Exposed Fixture Installation:
1. Install surface mounted and exposed fixtures as indicated on the Contract Drawings.
    a. Install surface mounted fixtures tight up against the substrate to eliminate gaps except where NFPA 70 (NEC) or local code restrictions require a separation between the fixtures and substrate.
2. Exit Fixture Installation:
    a. Install exit fixtures for doors directly over the doorways.
    b. Center the fixtures over the doorways, and install the fixtures to clear the door and associated hardware.

D. Poles
1. Use web fabric slings (not chain or cable) to raise and set poles.

2. Mount pole to foundation with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
3. Secure poles level, plumb, and square.
4. Grout void between pole base and foundation. Use non-shrinking or expanding concrete grout firmly packed in entire void space.
5. Use a short piece of 1/2-inch- (13-mm-) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

2.5 INTERFACE WITH OTHER WORK

A. Verify the locations and clearances of other installed or proposed work, and coordinate lighting fixture installations accordingly.

B. Coordinate the installation of lighting fixtures with all building systems and components to avoid any installation conflicts.

2.6 FIELD QUALITY CONTROL

A. Inspect, test, and certify lighting and the associated electrical distribution system and equipment in accordance with the requirements of Section 26 05 63.

2.7 CLEANING

A. Clean new lighting fixtures by following the cleaning procedures as recommended by the fixture manufacturer:
   1. Use only those products for cleaning as recommended in the fixture manufacturer's literature.

2.8 AIMING AND FOCUSING

A. Contractor shall notify the owner one week in advance and establish schedule for a night when final aiming will be done.

B. Lock the aiming adjustments, set during final aiming, in position. Position must hold during relamping and normal maintenance.

END OF SECTION

SECTION 27 32 00 - TELEPHONE SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Requirements for the design and installation of telephone equipment wiring system in Communication Rooms.

B. Requirements for the complete design and installation of station telephones and telephones in new buildings.

1.2 SUMMARY

A. This Section specifies the requirements for all components of the telephone infrastructure furnished and installed under this contract.

1.3 STANDARDS AND REGULATIONS:

A. EIA/TIA 310 Racks, Panels, and Associated Equipment

B. EIA/TIA-568 Commercial Buildings Telecommunications Cabling Standard

C. EIA/TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces

D. EIA/TIA TSB-67 Transmission Performance Specification for Field Testing of Unshielded Twisted Pair Cabling Systems

E. EIA/TIA-607 Commercial Building Grounding and Bonding Requirements for Telecommunications

F. IEEE 1100-1992 Recommended Practice for Powering and Grounding Sensitive Electronic Equipment

G. IEEE/ANSI C2 - National Electrical Safety Code (NEC)

H. NEMA 4X National Electrical Manufacturers Association

I. NFPA-70 National Electrical Code

J. UL Standard 13 Power-Limited Circuit Cables

K. UL Standard 444 Communications Cables

L. UL Standard 497 Protectors for Paired Communications Circuits

M. UL Standard 497A Secondary Protectors for Communication Circuits

N. UL Standard 910 Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables Used in Spaces Transporting Environmental Air

O. UL Standard 1449 Transient Voltage Surge Suppressors DoD (Second Edition)

P. UL Standard 1581 Electrical Wires, Cables and Flexible Cords

Q. Other construction, and/or electrical standards referenced elsewhere in this Specification as applicable.

1.4 RESTRICTIONS AND QUALITY CONTROL:

A. All telephone system wiring shall comply with the Standards and Regulations of Article 1.2 of this Section, as well as all other applicable construction and/or electrical requirements defined in this Specification.

B. Telephone cabling system shall, at a minimum, meet Category 6 requirements as defined by the EIA/TIA-568 standard.

1.5 SUBMITTALS:

A. Telephone Wiring Plan:

1. Prior to preparation of shop drawings, submit for approval a Telephone Wiring Plan including, at a minimum, the following information:

a. Complete schematic diagrams of the complete cabling system as proposed to be installed.

b. Detailed locations of all telephone jack plates and/or floor boxes.

c. Locations of all telephones and all other exterior and inter-building telephones and wiring.

d. Preliminary routing and termination locations of all telephone cables including incoming overhead fiber optic cables from Telephone Company.

B. Products:

1. Any product that is of a specific make and model number already approved for use by METRO NORTH.

C. Final Design Drawings:

1. Prior to installation, submit for approval shop drawings related to the Telephone System. These drawings shall provide, at a minimum, the following information:

a. Typical installation details for each unique type of wall jack, floor box, patch panel, and distribution frame.

b. Detailed routing of all telephone cable, including detailed information regarding types and quantities of cable, conduit, and raceways.

c. Detailed plans showing termination locations of all circuits on any punch block, backboard, or main distribution frame.

D. Final Test Results:

1. Perform standard tests (as described in the Standards and Regulations of Article 1.2 of this Section) of all telephone system wiring and of the yard telephones.

2. Submit for approval test procedures to the engineer at least 6 weeks before scheduling tests.

E. As-Built Drawings:

1. Provide fully-conformed set of as-built drawings for the telephone wiring system.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Cables and Wires - Each cable shall have permanent, legible, machine-generated label compliant with TIA 606B.

B. Equipment - Label each equipment chassis and device with a unique identifier identified on drawings.

2.2 CRITERIA:

A. Telephone system products shall comply with the Standards and Regulations of Article 1.3 of this Section, as well as all other applicable construction and/or electrical requirements defined in this Specification.

B. Telephone system products shall be the same as, or shall be an approved equal to like products already approved for use by METRO NORTH, and/or already in use by METRO NORTH at other sites.

C. Telephone cabling and connecting hardware shall, at a minimum, meet Category 6 requirements as defined by the EIA/TIA-568 standard.

2.3 EQUIPMENT:

A. Main Distribution Frame / Termination Frame.

1. Each MDF rack shall consist of a jumper trough, support frame and 10 cross-connect modules. Split 100-pair and connectorized 200-pair modules shall be utilized.

2. Each MDF support frame shall be fabricated of cold rolled steel with welded construction. It shall be equipped with support arms for mounting 10 cross-connect modules jumper wire retainers, and a ground bar.

3. The MDF support frame shall be made rigid by securing it to the concrete floor by securing overhead or providing additional bracing.

4. Each split 100 pair cross-connect module shall consist of four split 25 pair connectorized punch- down blocks installed on a mounting block. Each 200-pair cross-connect module shall consist of four 50 pair connectorized blocks installed on a mounting block.

   a. The cross-connect module-mounting block shall be equipped with a hinged, latching front cover and shall be equipped with all hardware for mounting on the support frame. The inside of each cover shall be marked with cable pair designations identifying all circuits that terminate on the module.

   b. Each punch-down block shall consist of two rows of 50 two-termination clips, imbedded in an impact resistant molded plastic base.

      i. Termination clips shall accept #20 AWG through #26 AWG insulated conductors. Each two-termination clip shall be pre- wired to one conductor of a 25-pair Amphenol-type RJ21X connector socket, or approved equal.

      ii. Each connector socket shall provide positive contact electrical connections and shall be equipped with a means for physically attaching the connector to the socket (flexible tie down strip or other technique).

      iii. The base of each punch-down block shall have a 25 pair plastic fanning strip on each side of the split block. Each fanning strip shall be permanently marked so as to identify the pair number (1 through 25) terminated on the adjacent clip.

B. Local Distribution Frames

1. A Local Distribution Frame (LDF) shall be provided at each Communications Room or Cabinet where required. Each LDF shall consist of the following equipment:

   a. A minimum of one 100 pair connectorized protected entrance terminals, as described in (TBD).

   b. Each contained within a separate enclosure. Enclosure shall have a fully removable cover in order to provide access to protected terminal blocks.

   c. A minimum of four 110 Type CAT 6 50-pair connectorized terminal blocks (as described in Article 2.2) utilizing 25 pair connectors per item D below shall be provided as cross-connects.

C. Punch Blocks

1. Blocks shall be 110 Cat 6 Type 50-pair punch-down blocks. Blocks shall be configured with two columns of 25 pairs of two termination clips. Clips shall accept #22 AWG through #26 AWG insulated wire

2. Clips shall be pre-wired to an Amphenol type RJ21X connector socket or approved equal.

3. Blocks shall be equipped with a base, standoff bracket, cover, and bridging clips.

4. The base shall be impact resistant plastic.

5. Molded fanning strips shall be provided on each side of the split blocks.

6. Permanent numbering shall be applied to the fanning strips.

7. A standoff of 50 mm (2 inch) from the mounting surface shall be provided.

8. A removable cover shall be provided, with circuit designations permanently applied.

9. Connector retention screws shall be provided.

D. Copper 25-Pair Connectors

1. Connectors shall be Amphenol-type RJ21X and shall be Type 66 rated, or approved equal, with a self-extinguishing thermoplastic housing.

2. A slide on cover shall protect the connector contacts.

3. Retention screws shall be provided.

4. Connectors shall be non-reversible and shall be compatible in design and type (male/female) with the associated receptacles.

5. Connector Contacts

6. Two rows of 25 contacts shall be provided.

7. Contacts shall be insulation displacement type, designed to accept #22 AWG to #24 AWG wire.

E. Backboards

1. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels in Division 06 Section "Rough Carpentry".

F. UTP Cable

1. As indicated on the contract drawings.

2. Comply with ICEA S-90-661 for mechanical properties.

3. Comply with TIA/EIA-568-B.1 for performance specifications.

4. Comply with TIA/EIA-568-B.2, Category 6.

5. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a. Communications, General Purpose: Type CM or CMG.

b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.

c. Communications, Riser Rated: Type CMR; complying with UL 1666.

d. Communications, Limited Purpose: Type CMX;

e. Multipurpose: Type MP or MPG.

f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.

g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

G. All equipment shall be the product of one manufacturer for compatibility:

1. Cable Management: Avaya 1100D1-35-19 horizontal/vertical cable management or approved equal.

H. Cable Support

1. J-hooks on drop wire, Milestek #70-50215 or approved equal.

2. J-hooks on drop wire, Milestek #70-50247 or approved equal.

3. J-hooks on T-bar, Milestek #70-50248 or approved equal.

I. Exterior 8-Wire (CAT 6) Telephone Cable (for yard and other exterior telephones)

1. Surge Protectors (for backbone copper cable and exterior telephone wiring entry points).

PART 3 - EXECUTION

3.1 PREPARATION:

A. Contractor shall finalize the configuration, mounting, and interfaces to patch panels and termination blocks for all equipment and systems.

B. Contractor shall furnish, install, and test all new equipment and cabling.

3.2 INSTALLATION:

A. Install interior telephone system wiring as per approved drawings using approved products.

B. Install telephones and other exterior telephones and wiring as per approved drawings using approved products.

3.3 START UP AND TESTING:

A. Perform standard tests (as defined in the Standards and Regulations of Article 1.2 of this Section) of all telephone system wiring and of the yard telephones. Submit tabulated results of the tests.

B. Work with METRO NORTH to make final configuration and integration of the telephones with METRO NORTH's existing Private Branch Exchange system or commercial carrier.

END OF SECTION

SECTION 28 46 20 – FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 Scope of Work.

A. Furnish and install a complete and operational fire alarm system configured for:

1. Protected premises (general alarming)

2. Elevator fire safety control

B. Program, test and place the system in operation as specified herein and as directed.

C. For distributor supported fire alarm systems, manufacturer shall have a minimum of three manufacturer- authorized independent service companies in the New York metropolitan area.

1.3 Codes, Standards and Specifications.

A. The fire alarm system items furnished and installed under this Specification shall comply with the following codes and standards. In the event of a conflict between standards, the requirements of the New York State Code shall apply. Where the Building Code is silent, the requirements of reference standard that is applicable to the issue will prevail subject to the Engineer's determination.

1. 2016 New Yok State Uniform Code (2015 International Building Codes and 2016 New York State Uniform Code Supplement)

2. NFPA 70

3. NFPA 72

4. Underwriters Laboratories Standard 864- 9th Edition

5. National Equipment Manufacturers Association Standards

6. NFPA 2001 Clean Agent Fire Suppression Systems

1.4 Submittals.

A. No submittals will be reviewed prior to the approval of a fire alarm system technical expert.

B. No submittals will be reviewed without the signature of the fire alarm technical expert on product data sheets and drawings

C. Submit the following for approval as one package:

D. Product data sheets for each fire alarm component specified herein.

1. Fire alarm panel with all required cards and power supplies
2. Batteries
3. Remote annunciator
4. Digital alarm communicator (DACT)
5. IP capture card
6. Notification appliances, extender panels and associated synchronization device, wiring methods, and external enclosures
7. All fire initiating devices, including test stations and remote LED's as applicable in the design
8. Addressable control, signal and monitor modules
9. Line and low voltage surge protectors
10. Auxiliary relays
11. Calculations for the following:

    a. Battery calculations that include the following:

        i. A derating factor of 1.5 shall be added to the power demand of the system.

    b. General evacuation systems shall be sized to a 24 hour standby/5 minute alarm period. Sequence of operations in the form of a full input/output matrix by address and function.

    c. All inputs/outputs shall describe all devices and outputs in text form by facility level, zone/location, and room such as "Mezzanine Level, north end of station, communications room". This text shall also be approved by the User.

    d. Formatting of Input/output matrix should follow NFPA 72 Figure A.10.6.2.3 (9) in principal.

    e. Identification methods of building equipment and suppression interfaces shall be as shown on the riser diagram. This matrix shall be based on the Sequence of Operations.

    f. This matrix shall be based on the Sequence of Operations.

12. System riser drawing showing cable types, all fire alarm circuit and peripheral devices up to and including power supply sources, telephone and data network connections, auxiliary relays, isolation modules, test stations, remote annunciators, remote LED's and end-of-line resistors.

    a. Interconnected equipment shall be identified on the riser as shown on the sequence of operations, including device addresses, device descriptions, horn/speaker/strobe circuits and strobe candela settings

    b. A field device equipment table shall be shown by symbol, quantity, part number, manufacturer and description.

    c. A cable and wire legend shall be shown.

    d. A conduit plan shall not be depicted for the riser diagram- circuits shall be shown individually without reference to conduit assignment or arrangement

13. Panel wiring drawing with all power, signaling, control boards and associated wiring with points of termination.

    a. A panel component/card list shall be shown by part number, name, manufacturer and quantity.

    b. A cable and wire legend shall be shown.

14. Layout drawings showing all devices and related peripherals such as remote LEDs, conduit paths, conduit size/circuit assignments, conduit installation details, and end of line supervisory devices.

    a. "Standard Schematic drawings" which are non-specific to the contractual work shall not be accepted.

    b. A cable and wire legend shall be shown.

15. Device wiring connection details for all peripheral devices under this contract.

16. Methods of installation for enclosures, back boxes, cable and conduit under this contract.

17. Fire alarm panel elevation and plan drawings showing all heights, width and depths of panels, power supplies, troughs and conduit and their relation to other equipment and the architectural layout in the area where the fire alarm panel will be installed.

18. Fire Alarm panel front view details indicating all override switches, status LED's.

19. Fire alarm device mounting elevations.

20. Remote annunciator mounting details and placement relative to other equipment at its proposed location.

21. NFPA 72 and NFPA 70 code compliance checklist identifying all code requirements with which the design complies

    a. Code-Compliance Checklist shall be submitted with the Design Checklist to indicate that the design complies with all applicable requirements of the codes, provisions and standards of paragraph 1.2, Codes, Standards and Specifications.

    b. Prepare the Code-Compliance Design-Checklist in a format with columns for the following: a description of each design aspect or feature (e.g., manual pull station locations); the applicable section, paragraph and subparagraph number of the code/standard and each code/standard it references; a concise description of the requirement; and the statement that the design "complies," or an explanation if a variance is required.

    c. The Authority will not review submittals for the fire detection/alarm system unless the Code-Compliance Design Checklist has been submitted.

    d. All drawings shall be sealed by a Professional Engineer licensed by the State of New York.

PART 2 - PRODUCTS AND SYSTEM FUNCTIONALITY.

2.1 Manufacturers.

A. The Fire Alarm Control Panel shall be as per NYCT Qualified Product List (QPL):

1. Simplex model 4100-NEMA (New York, NY, telephone 212-372-4200) or

2. Edwards EST-3 NYCT (Bradenton, FL, telephone 888-437-3287)

B. NEMA 12 enclosure is not required.

C. The components in this specification refer to Simplex peripherals and components. The contractor shall submit equivalent components and circuit arrangements in the event that an EST3 NYCT QPL is selected.

2.2 Panel Enclosure Components and System Functionality.

A. The panel shall provide system fault tolerance as follows for the circuits as indicated in the detailed description of work:

1. Signaling/network circuits- Class A, style 6

2. Annunciator circuits- Class B

3. Notification appliance circuits- Class B

4. Not used

5. Initiating device circuits (connected to an addressable monitoring device) – Class B

6. Auxiliary power circuits- Class A (monitored and with “Class A” back feed via relay upon fault detection)

B. Software/firmware selected shall represent the latest generation at the time of system programming. No software/firmware component provided shall be at the end of its life cycle, nor shall it be in a “beta test” version or in any other manner not thoroughly tested and in current wide spread commercial use.

C. The fire alarm system technical expert shall assign all modules specified herein to the available slot and block assignments for each expansion bay in accordance with the manufacturer’s requirements.

D. The fire alarm technical expert shall develop the Fire Alarm Panel override switches and status LED module layout and select the appropriate modules for the functions specified herein.

E. All enclosures shall include the following base components:

1. Master Controller Assembly: Simplex model 4100-9111

2. DACT: Simplex model 4100-6052

3. Dialer Capture Ethernet Module: BOSCH model Conettix C-900V2 (130 Perinton Parkway, Fairport, New York, 14450, telephone 800-289-00965 (for future use).

4. The following modules are required to meet the circuit and device arrangement as shown on the riser diagram:

a. Expansion Bay Assembly: Simplex model 4100-2300

b. Expansion Power Supply and Modules: Simplex model 4100-5101/5115

c. IDnet Modules: Simplex model 100-3101/3104/3105

d. 8 pole relay Board: Simplex model 4100-3206

e. LED Module Simplex model 4100-1276

f. Monitor Modules: Simplex model 4090-9001

g. Auxiliary Relays: Air Products MR-101

5. Soft-keys for the Master Controller shall be assigned as follows in all cases:

a. Lamp Test

b. CAMS Disconnect

6. Batteries shall be provided and sized for a 24 hour standby/5 minute alarm.

a. Furnish and install Simplex 2081 series batteries.

b. Furnish and install Simplex 2081-9280 separate enclosure for 110 Ah batteries.

7. Alarm verification shall not be enabled unless directed by the Engineer as per field conditions. Cross zoning applications shall never have alarm verification enabled.

8. Device sensitivity shall not be changed from its default state unless otherwise directed by the Engineer.

9. Four levels of maintenance access shall be provided as follows:

    a. Level 1 shall be the lowest level of access and shall not require a password.

    b. Levels 2, 3 and 4 shall utilize the manufacturer's default password (i.e.- typically a single digit string corresponding to the same numeric access level). Unique passwords shall not be utilized.

10. The Fire Alarm Control Panel (FACP) shall permit one person system walk test.

11. DACT and Ethernet Module connectivity shall be arranged as follows:

    a. All trouble and alarm points shall be annunciated via Ademco 4+2 format.

    b. Outputs shall include dirty and excessively dirty indications for each smoke detector.

    c. Priorities and Supervision:

        i. Primary call-out shall be via DACT line 1 to the telephone system.

        ii. Secondary call-out shall be via DACT line 2 to the telephone system.

        iii. The Dialer Capture Ethernet Module shall be installed inside the fire alarm control panel as per the manufacturer's recommendations unpowered for future use.

        iv. Failure of the DACT shall be annunciated on the fire alarm panel.

        v. The DACT shall be programmed for an automatic test of each line once per 24 hour period on an alternating basis.

12. Alarm audible signals

    a. General evacuation signals shall be temporal 3 (3-3-3).

    b. Carbon monoxide detection evacuation signals shall be temporal 4 tone.

    c. Releasing signals shall be:

        i. First alarm signal- 60 bpm slow march

        ii. Cross zone signal- 120 bpm or temporal 3

        iii. Discharge signal- Continuous horn

2.3 Remote Annunciator Panel.

A. The remote annunciator is used to provide an alternative signal receiving location as per OSS requirements.

B. Furnish and install Simplex model 4603-9101 LCD Annunciator with model 4603-9111 trim plate.

C. Provide mounting boxes as required herein for surface or recessed mounting.

D. The annunciator shall not be capable of acknowledging alarms and resetting the FACP.

E. Item e above shall require a key enable. Furnish ten (10) annunciator keys.

2.4 NAC Extender Panel.

A. Furnish and install IDnet NAC extender by Simplex model 4009-9201, with the following options

B. Additional four (4) point NAC Module: Simplex model 4009-9807.

C. Red Door- Simplex model 4009-9805

D. The NAC extender panel shall be housed within a stainless steel outer NEMA 12 enclosure as manufactured by Hoffman, Concept Line Enclosures, or approved equal. The contractor shall size this enclosure and submit for approval.

2.5 Manual Fire Alarm Pull Stations.

A. Furnish and install Simplex model 4099-9003, Addressable Double Action Manual Pull Station.

B. Furnish and install Simplex model 2099-9144, Explosion Proof and Weather Proof DPDT Single Action Manual Pull Station (use where shown on drawings).

C. Furnish and install Simplex model 4099-9012 releasing station with model 4099-9802 releasing labels.

D. Provide all related back boxes for the mounting application as required.

2.6 Detectors.

A. Smoke detectors:

1. It shall be Simplex model 4098-9714 (photoelectric sensor) with Simplex model 4098-9792 (sensor base).

2. Provide wire guard model Simplex model 2098-9715 for devices as determined by detailed design.

3. For concealed detectors where the alarm–indicating LED is not visible, provide a remote LED indicating device. It shall be Simplex model 4098-9789 (sensor base with LED output).

4. Provide Simplex model 2098-9808 (remote LED).

5. Provide all related back boxes for the mounting application as determined by the detailed design.

B. Thermal detectors:

1. It shall be Simplex model 4098-9733 (heat detector), set at 135 degree setting and rate of rise function if needed per environmental conditions, with Simplex model 4098-9792 (sensor base)

2.7 Addressable Monitor, Control, and Signal Modules.

A. Where required by the detailed design, enclosures approved for the environmental conditions noted on the drawings, with viewing window shall be provided for modules. Furnish and install Hoffman Concept Series enclosures, or approved equal.

B. The Contractor shall size the enclosure to group the modules within the enclosure if required by the detailed design.

C. Monitor modules are used to track to track dry contact closures from non-addressable fire alarm devices and interfaced equipment.

1. It shall be Simplex model 4090-9001 Supervised Individual Addressable Module.

D. Control modules are used for panel to panel communication dry contact interfaces, low voltage switching, and normally powered, fail safe auxiliary power arrangements.

1. The T-sense permits status tracking if required by the design.

2. It shall be Simplex model 4090-9118- Relay IAM with T-Sense.

E. Signal modules are used for reverse polarity supervision to the coil of interposing/line relays as well as for the control of notification appliance circuits.

1. It shall be Simplex model 4090-9007.

F. Provide the manufacturer’s required back boxes for the mounting application as required by the detailed design.

G. All mounting components as identified in the product data sheet shall be provided with optional trim plate and mounting bracket to allow viewing of the module status LED after the installation in the back box.

H. Refer to sequence of operations for programming requirements.

2.8 Interposing and Line Relays.

A. Interposing relays are required to electrically isolate addressable control modules where the control modules do not support the required contacts rating.

1. The interposing relay shall have DPDT 10 Amp resistive contacts ratings at 120VAC.

2. The interposing relay shall be model MR-101/C/R with red enclosure, manufactured by Air Products and Controls, Pontiac MI 48340, telephone 888-332-2241 or approved equal. Utilize "T" model if environmental conditions require a NEMA enclosure.

B. Provide all related back boxes for the mounting application as required by the detailed design.

C. All trim components shall be equipped with an LED view port.

2.9 Fire Signaling Devices.

A. Visual (all within a field of view) and audible signals shall be synchronized.

B. Candela and audible settings shall be as indicated in the detailed description of work.

C. Fire signaling devices shall be 2 wire devices and listed as a Special Application device under the UL 864 listing of the fire alarm control panel, except as specified herein.

D. Fire Alarm horn/strobe and strobe devices shall be UL1971 and UL464 listed.

E. Fire Alarm horn/strobe and strobe devices shall be wall or ceiling mounted, as required by the detailed design. For surface mount applications, furnish and install surface mount adapter skirt, Simplex model 4905-9937.

F. Wall mounted horn/strobes shall be Simplex model 4906-9127. Strobe is multi-candela 15/30/75/110 cd

G. Ceiling mounted horn/strobes shall be Simplex model 4906-9128. Strobe is multi-candela 15/30/75/110 cd

H. Wall mounted strobes shall be Simplex model 4906-9101. Strobe is multi-candela 15/30/75/110 cd.

I. Ceiling mounted strobes shall be Simplex model 4906-9102. Strobe is multi-candela 15/30/75/100 cd.

J. Sound attenuator Simplex model 4905-9838 only as directed by the Engineer by quantity and location.

K. Wire guard model Simplex model 4905-9961 for wall devices.

L. Wire guard Simplex model 4905-9928 for ceiling.

2.10 Surge Protection.

A. For 120 VAC protection, utilize Ditek model DTK-120SD Series Surge Protector, or approved equal.

B. For NAC and 24 VDC protection, utilize Simplex 2081-9028 Loop Protector, or approved equal.

C. For SLC protection, utilize Simplex 2081-9044 Over voltage Protector, or approved equal.

2.11 Signage.

A. Furnish a fire alarm system procedure sign to be installed at the fire control panel. The procedure shall be brief and written in a non-technical manner and shall include instructions to:

1. Acknowledge alarm and trouble points

2. Silence signals

3. Reset the panel

4. The Identification of all field devices that must be cleared prior to reset smoke detectors, etc.

5. Telephone number to report system troubles. This telephone number shall be provided by Metro North Railroad.

6. Procedure sign shall be an aluminum or stainless steel frame, plexiglass front and sheet aluminum backing plate; minimum size sign 8 1/2” X 11”, secured with vandal resistant screws.

B. Furnish a sign to be installed near each manual pull station to provide system information. Submit for approval.

1. Sign shall be an aluminum or stainless steel frame, plexiglass front and sheet aluminum backing plate; minimum size sign 8 1/2" X 11".

2. The sign shall include a description of the general location of the fire alarm manual pull station.

3. It shall indicate “Alarm Does Not Notify Fire Dept. - Call 911 For Emergency”.

4. Prepare the information on a pc and print out in black ink on white paper using a laser quality printer. Provide the information in electronic media using an approved software package.

5. Secure the sign with four vandal-resistant screws such that the information cannot be revised without removing the sign from the wall.

C. Provide a sign above each pull station to direct attention to its location.

1. The sign shall read “Fire Alarm” vertically from top to bottom on two sides.

2. The sign shall be approximately 4 inches on a side by 18 inches high with red lettering on a white background.

3. The sign shall be the style number 39433 three dimensional, rigid vinyl marker as manufactured by Seton Name Plate Company, Branford, CT, telephone 800-243-6624, or approved equal.

4. Mounting height shall be as approved in the field by the Engineer. Mount the sign with screws through the pre-drilled holes.

PART 3 - CONSTRUCTION METHODS.

3.1 Installation.

A. General Installation Requirements.

1. Install all equipment being furnished, unless otherwise indicated on the detailed description of work or specified herein. Install system in accordance with manufacturer's printed instructions unless otherwise indicated.

2. Protect all detection and notification devices - with the manufacturer's protective cover, or by a bag secured around the device - until final acceptance testing.

3. Labeling Circuit Disconnect: Label the device used as the circuit disconnecting means for the dedicated branch circuit serving the system "FIRE ALARM CIRCUIT CONTROL."

4. Rigidly mount fire alarm detection devices, using the manufacturers recommended back boxes, to building structural members, permanent walls or ceilings.

5. Install all modules in enclosures. Enclosure requirements (weatherproof, explosion proof, etc) are indicated in the detailed description of work for identified areas of the facility.

6. Identification of Circuits, Devices and Device Enclosures: Identify all wires and cables by system and function and interconnection cabinets and control panels to which they connect. Identify all Devices and Device Enclosures.

7. Electrical enclosures and conduits shall contain only those electrical circuits associated with the fire detection and alarm system and shall not contain any circuit that is unrelated to the system. Refer to detailed description of work for circuit and conduit requirements.

8. Routing.

a. Provide fire alarm system conduits either parallel or perpendicular to building structural members.

b. Provide fire alarm detection system conduits at a height so as not to obstruct any portion of a window, doorway, stairway or a passageway, and to not interfere with the operation of any mechanical or electrical equipment. Headroom clearances shall be as per NYS Code requirements.

c. Route fire alarm detection system conduits to minimize the potential for physical damage.

d. Fire alarm detection system conduits, junction boxes, pull boxes, terminal cabinets, control enclosures and device back boxes shall be accessible for testing, service and maintenance.

9. Wall, Floor, Ceiling, and Roof Penetrations.

a. Provide conduit penetrations of walls with sleeves and escutcheon plates on either side of the wall. Penetrations shall be fire-stopped, thermal-stopped and/or water-stopped as required by the detailed design.

b. Conduit penetrations of walls, floors, and ceiling shall be sleeved. Seal around the conduits, restoring the walls, floors and ceilings to their original condition, fire resistance and integrity.

c. Seal around the conduits at conduit penetrations in roof. Submit details.

10. Concealment.

a. Electrical conduit shall be concealed or exposed as indicated on the detailed description of work.

b. Conduit, raceways, junction boxes, panels, electrical enclosures, relays and device back boxes are permitted to be fully exposed in unfinished areas.

c. Provide fire alarm detection system junction boxes, electrical enclosures, relays and device back boxes accessible for inspection, testing, service and maintenance.

d. Provide a means of designating installation locations for concealed devices such as a duct detector above a hung ceiling. Furnish and install a device location marker and label at each device location, or designate the locations by other approved means.

11. Terminations.

a. Number terminals or terminal strips of all fire alarm detection conductor terminations, except splices in shield drain conductors. Fire alarm conductors shall terminate directly to devices with no intermediate splice or T-taps. Terminals and terminal strips shall be suitable for the size, number of conductors connected and voltage rating of conductors.

b. Terminations to terminals other than barrier/pressure plate type terminals shall use crimp-on ring-type or Y-type spade connectors.

c. Splices shall be permitted in shield drain conductors only. Such splices shall use a crimp type pigtail or parallel connector and be taped to prevent shorts to ground.

12. Control Panel Wiring.

a. Fully dress and bundle control panel wiring with nylon tie wraps. Route bundled wiring parallel to terminal strips within control panels, with individual conductors turned out at 90 degree angles to their associated terminal connections. Bundle and route AC power conductors separately from low voltage conductors. Maintain a minimum 2-inch separation between AC power conductors and power limited conductors wherever possible. Size the control cabinets to accommodate the requirements of these Specifications.

b. Uniquely number each conductor terminating within a control panel with durable plastic tags or make uniquely identifiable by a combination of numbers and color codes. Show these conductor numbers on the record drawings in a manner allowing ready identification of any field wiring conductor in any control panel.

c. Control panels shall not be used as raceways. Conductors which do not terminate within a control panel shall not be routed through that control panel.

d. The control panel shall be powered through from a fused disconnect switch. Refer to the Electrical Specifications for over current protection, ground, conduit and wiring requirements.

13. Shielding.

a. Conductor shielding shall be continuous (with no splices) for the length of the circuit, bonded at the associated control panel only.

b. Trim and tape shield drain conductors and foil to prevent grounding of the shield to enclosures and conduit.

14. Devices (General).

a. Wiring Methods.

i. Wire fire alarm detection system initiating and indicating devices to allow supervision of their associated conductors through the device, such that disconnecting any conductor for the device will cause a trouble indication at the fire alarm control panel.

ii. Conductors looped around terminals are not acceptable.

iii. Wire nuts are not acceptable except where provided for devices containing flying leads.

iv. Size device back boxes, junction boxes and pull boxes to accommodate the maximum fill and bending radius of conductors contained therein. Extension rings or extension boxes are not acceptable.

b. Locations.

i. The contractor shall determine the exact location of all fire alarm equipment as indicated on the detailed description of work and as specified herein.

c. Sensitivity.

i. Adjust each smoke detector's sensitivity to eliminate false alarms. Adjust each device to its threshold of maximum sensitivity as determined by its particular environment.

15. Testing.

a. General:

i. Test fire detection alarm system, in accordance with the requirements of NFPA 72 and approved testing procedures.

ii. Metro North Railroad and other agencies having jurisdiction four weeks in advance of the date and time when any tests are to be made.

iii. Provide all required documentation to Metro North Railroad.

iv. Testing shall be performed in the presence of Metro North Railroad or their designated representative.

v. The approved fire alarm manufacturer's technical expert, or designated representative shall supervise the testing – including final testing, adjustment of the system and training, which shall include instructions to maintenance personnel on operation and maintenance features of the equipment.

b. Certification of Testing.

i. Upon completion of the system testing, provide the Engineer with written certification of testing as required by this Specification.

c. Acceptance Testing.

i. Perform a final acceptance test of the fire alarm detection system components in the building in the presence of Metro North Railroad or their designated representative.

ii. This test shall be scheduled by Metro North Railroad upon completion of the work, after receipt, review and acceptance of the system certification required by this Specification.

iii. Final acceptance tests will be directed by Metro North Railroad, shall be performed by the Contractor, and shall include at a minimum:

I. Functional testing of 100% of the initiating devices.

II. Functional testing of 100% of the evacuation signaling devices.

III. Supervisory testing of 100% of the initiating devices and 100% of the initiating device circuits.

IV. Supervisory testing of 100% of the evacuation signaling devices and 100% of evacuation signaling circuits.

V. Functional testing of all fire safety control and equipment monitoring interfaces.

VI. Testing of standby battery power.

VII. Verification of proper annunciation of all signals at the fire alarm control panel (FC) and remote annunciator.

VIII. Verification of proper automatic transmission of fire alarm signals.

IX. Verification that all areas of the facility have a minimum decibel level of 15 dba above the average ambient sound level measured 5 ft above the floor.

X. Any additional test deemed necessary by Metro North Railroad.

iv. 100% successful performance during final acceptance testing is required. Failure of a final acceptance test shall invalidate the system certification, in which case recertification (including 100% Contractor retesting) and a repeat of the final acceptance test shall be required at no additional cost to Metro North Railroad. Elevator recall shall be fully operational at the time of acceptance.

3.2 Programming/Software.

A. Program the system to operate as indicated in the detailed description of work.

B. The system shall not be password protected.

C. Deliver for the use of Metro North Railroad, the system database for future, modification and configuration of the system.

D. Software/firmware supplied shall represent the latest generation of products generally accepted throughout the industry. No software/firmware component provided shall be at the end of its life cycle, nor shall it be in a “beta test” version or in any other manner not thoroughly tested and in current wide spread commercial use. Access to the panel programming functions shall not be password protected.

END OF SECTION

SECTION 31 00 00 – EARTH MOVING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. The following work items are included:

1. Excavation and backfill for pavement, curbing, drainage, foundations, structural, mechanical and electrical improvements.
2. Install sediment and erosion controls as needed, to maintain sediments on site and within the active construction area.
3. Backfill with approved materials compacted as required herein.
4. Stockpile excavated soil for re-use, where applicable. Stockpile separately hazardous waste and soils suspected of containing hazardous waste, if found.
5. Haul and dispose of excess excavation spoils from site or reuse excavated material as ordered by the Engineer and in compliance with all applicable contract provisions and rules and regulations.
6. Restoration of surface pavement sections damaged by new work.
7. Final grading as specified on the drawings.
8. Furnish and place topsoil obtained from sources outside the work area, for the preparation of planting beds and lawn areas, and shall bring the site to the lines and grades shown on the plans. The Contractor shall also test the topsoil for organic content, pH and sieve analysis.
9. Installation of woven geotextile fabric in accordance with the plans or as directed by the Engineer.

1.2 RELATED SECTIONS

A. Section 02 61 00 Sampling, Testing, Handling, Removal And Disposal of Soils

B. Section 31 23 19 Dewatering

C. Section 31 50 00 Excavation Support and Protection

D. Section 31 23 16.26 Rock Removal

E. Section 31 25 00 Erosion and Sedimentation Controls

1.3 SUBMITTALS

A. The following submittals to the Engineer shall be required prior to commencement of work for approval:

B. Laboratory test reports on backfill materials including gradation using ASTM D 422 and compaction curves using ASTM D 1557 where fill is subject to compaction control.

C. 10 lb. samples of each backfill type proposed, 90 lb. if required for compaction test.

D. Location plan showing intended soil stockpile areas, equipment laydown, and material storage.

E. Data on intended excavation equipment including bucket capacity, teeth size. In addition, data on intended compaction equipment.

F. Name and location of certified landfill where hazardous and/or contaminated soils and water, if any, shall be transported to. The name and address of the hazardous waste hauler shall also be provided.

G. Plan of Methods and Sequence of Excavation

H. Test Reports on Offsite Fill Materials. The Contractor shall sign, and submit, Metro-North's Clean Fill Certification, and comply with its provisions prior to transporting offsite fill to Metro-North locations.

I. All topsoil must be approved by the Engineer prior to delivery to the site. Contractor shall be required to sample and test soil, at no additional cost to the owner. Testing lab must be approved by the Engineer two weeks prior to submission of any samples.

J. Submit during construction as applicable:

1. Representative 10 lb. Sample(s), gradation test results and compaction test results for excavation spoils stockpiled on site for approval for reuse.
2. Design of intended excavation support to protect railroad structures where needed.
3. Records of all field and laboratory earthwork tests, including: Quality control tests of grain size, compaction tests and elevations of subgrades, final grades and utility inverts.
4. Asphalt mix for new or restored pavements shall be submitted to the Engineer.

1.4 QUALITY CONTROL

A. The following standards from the American Society for Testing and Materials (ASTM) apply:

1. ASTM D 422 - Method for Particle Size Analysis of Soils.
2. ASTM D 1140 - Test Method for Amount of Material in Soils Finer Than the No. 200 Sieve.
3. ASTM D 1556 - Test method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
4. ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of soil Using Modified Effort.
5. ASTM D 3017 - Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods.
6. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
7. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
8. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

B. Tolerances

1. Construct all finished subgrade and backfill surfaces to plus or minus 0.1 feet of the elevations indicated.

C. Inspection

1. Excavation of all open trenches shall be inspected and documented

1.5 PROTECTION OF EXISTING STRUCTURES

A. Existing structures, underground facilities, and utilities lines, where known, are indicated on the Contract drawings. The Contractor shall locate all known utilities prior to excavation. The Contractor shall notify Metro-North of any existing conditions encountered but not indicated on the Contract drawings. The Contractor shall exercise care to prevent damage to any existing facilities which are required to remain functional. The Contractor shall be fully responsible to Metro-North in the event of removal or damage of any existing objects that are intended by Metro-North to remain in place. In the event the Contractor uncovers any unmarked or unknown plant facility during the work, he shall report his findings to Metro-North for instructions before proceeding further. Also bench marks, fences, sidewalks, paving, curbs and any features remaining as a portion of final site conditions shall be protected.

B. The Contractor shall exercise extra care and excavate by hand only, in the vicinity of the electrical ducts and direct burial cables. No work shall be performed without the written approval of the Engineer.

1.6 PROJECT CONDITIONS

A. Protect excavations as follows:
1. Prevent water from entering excavated areas and, if it does, remove it immediately by an approved means to maintain a dry condition at all times.
2. Dispose of water in a manner not to cause injury to the public health or to public or private property and in compliance with all applicable rules and regulations and dewatering provisions in this contract.
3. If water enters excavated areas and weakens or disturbs underlying soil, remove the weakened or disturbed soil, as directed by the Engineer.
4. Where shown on the Contract Drawings or where required for protection of adjacent utilities or structures or where required for performance of the Work, secure the sides of excavations against movement as follows:
    a. Install excavation support system held in place by waling and bracing members. Top of excavation support shall extend at least six inches above ground.
    b. Do not excavate below the bottom of the excavation support system.
    c. Fill and compact voids behind sheeting immediately, with material approved by the Engineer.
5. Comply with all other provisions of the Specifications that may impose additional or stricter requirements.
6. For excavations extending to a depth of 5 feet or more, and where sheeting is not required on the plans, excavate slopes to a safe angle of repose, or protect trench excavations by use of a portable trench shield.
7. Restore all areas impacted by excavation to their original conditions, matching pavement types and sections to meet original pavement grades.
8. Do not traverse paved areas with tracked vehicles or equipment such as carry-all scrapers which may damage such pavement unless protected to the satisfaction of the Engineer.
9. Do not place fill or backfill on frozen subgrade.
10. No compaction is to be performed on soil within two feet of the ground water level without approved dewatering or the approval of the engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

Submit samples and test results on materials as discussed under “SUBMITTALS”.

A. GENERAL

1. General Backfill - The contractor may reuse excavated material for backfill that meets the following criteria:
    a. Granular backfill free of material greater than 4 inches in size
    b. Fill shall be free of wood, debris and other deleterious materials
    c. Less than 35 percent of the fill shall pass the #200 sieve by dry weight.
2. Utility Bedding Backfill -Granular fill having a fines content of less than 5 Percent and gravel size less than 3/4 inch. Bedding fill shall be either a well graded sand, sand-gravel blend, or a fine to medium gravel blend. This backfill may also be the same as No. 57 size gravel or crushed stone.
3. Where gravel is used to bed pipes, the trench excavation shall first be lined with filter fabric to prevent loss of surrounding soil into the bedding stone.
4. Structural Backfill - Fill used beneath footings to correct over excavation and below slabs on grade. Structural backfill shall consist of well-graded quartz sand, with less than 35 percent by dry weight gravel and no more than six percent passing the No. 200 sieve. Structural backfill shall adhere to the following allowable gradation envelope:

U.S. Standard Sieve Size	Percent Finer By Weight
1”	100
3/8”	65-100
No. 10	40-85
No. 30	20-65
No. 60	10-45
No. 200	5-12

5. Gravel - ASTM No. 57 size gravel or crushed stone (Bank Run Gravel), or Engineer’s approved equal. The allowable gradation envelope for Coarse Aggregate Size No. 57 is as follows:

U.S. Standard Sieve Size	Percent Finer By Weight
1 1/2”	100
1”	95-100
1/2”	25-60
No. 4	0-10
No. 8	0-5

6. Geotechnical Fabric - For separation purposes. Provide woven geotextile fabric as shown on the plans or as directed by the Engineer.
7. Silt fence - Manufactured and intended for sediment and erosion control meeting state and railroad standards. Provide TerraTex EP-11 as manufactured by Hanes Geo Components (Webtec) or Engineer’s approved equal.
8. Dense Graded Aggregate – Fill used beneath foundations, curbs and sidewalks and for roads. Standard Specifications Section 304 material conforming to NYSDOT (item 304.11 Subbase Course Type 1).

U.S. Standard Sieve Size	Percent Finer By Weight
2”	100
1 1/2”	90-100
1”	75-95

1/2”	45-70
No. 4	25-35
No. 10	15-40
No. 200	5-15

B. TOP SOIL

1. Material shall consist of natural loam topsoil, free from subsoil, obtained from an area which has never been stripped. It shall be removed to a depth of one (1) foot, or less, if subsoil is encountered. Topsoil, shall be of uniform quality, free from hard clods, stiff clay, hard pan, sods, partially disintegrated stone, lime, cement, ashes, slag, concrete, tar residues, tarred paper, boards, chips, sticks or any other undesirable material. Topsoil shall, comply with the following requirements:
   a. Organic content: Topsoil shall contain at least five (5) per cent organic matter determined by loss, or ignition, of moisture-free samples dries in accordance with the current method of the Association of Official Agricultural Chemists. The acidity range shall be PH 5.0 to PH 7.0 inclusive. The mechanical analysis of the soil shall be as follows:
      i. SIEVE ANALYSIS: (By Wash Test, ASTM Designation C-117)
         Passing 2" sieve 100%
         Passing 1" sieve 95% to 100%
         Passing #4 sieve 90% to 100%
         Passing #100 sieve 30% to 60%
   b. When the topsoil otherwise complies with the requirements of the specification but show a deficiency of not more than one (1) per cent in organic matter content, humus, peat moss or other approved organic matter may be incorporated when and as permitted by the HCD staff. The resulting topsoil mix shall be 20% peat moss and 80% topsoil. A screened organic fertilizer may be added on approval of the Engineer.
   c. No topsoil shall be delivered in a frozen or muddy condition.

B. Crushed Stone ASTM C-33, size No. 2 (2-1/2” to 1-1/2”) or No. 3 (2” to 1”). Use clean crushed angular stone. Provide one 91) 10-lb. bag with material certification for sampling.

C. Ballast - Use clean Metro-North approved ballast.

C. Dense Graded Aggregate - DGA shall conform to the materials requirements of NYSDOT Standard Specifications Construction Item 304.11 (Type 1) Subbase Course.

D. Box Beam Guide Rail, Box Beam End Sections, Weak Post Corrugated Beam Guide Rail and Corrugated beam Guide Rail End Sections shall conform to NYSDOT Standard Specification Section 606. Guide Railing shall be grounded in accordance with Metro-North and National Electric Code requirements.

E. Gabion retaining wall sections and stone fill shall conform to the manufacturer’s specifications. Gabion baskets shall be grounded in accordance with Metro-North and National Electric Code requirements.

PART 3 EXECUTION

3.1 PREPARATION OF WORK AREA.

A. Protect the excavation work area from surface water runoff by temporary soil berms, sandbags or other means to divert surface water away from the excavations. Install silt fencing and sediment control features to retain sediments on site, prior to commencing excavations. Sediments are to be contained in the active work area and not migrate into track ballast, parking areas or other portions of Metro-North property.

3.2 REMOVAL OF EXCAVATION SPOILS

A. Removal of stockpiles shall be performed in a manner that will avoid interference with other Metro-North subcontractor and railroad operations.

3.3 STOCKPILING OF EXCAVATION SPOILS

A. Excavation spoils stockpiled for reuse or for disposal shall be stored on-site at approved locations as shown on the drawings. If additional space is required it shall be supplied at the Contractor's expense.

B. The storage/stockpile area shall have a protective barrier to prevent material and persons from entering the tracks and which does not foul the tracks.

C. Stockpiles shall be protected from erosion and located away from water bodies and wetlands. Stockpiles shall be sloped at a stable configuration and shall be placed far enough from excavations, that the stockpile does not affect excavation stability. Stockpiles that are classified by test as hazardous waste, or suspected of containing hazardous waste pending test results, shall be adequately stored to prevent spread of contamination. Stockpiles that are classified as industrial material waste shall be reused as backfill in compliance with all applicable NYSDEC part 360 regulations with excess industrial soil being transported and disposed off site by permitted firms approved by Metro-North. Storage practices for hazardous soils shall be those approved by the regulating agencies, including: plastic ground sheeting, covering with weighted tarpaulins, and containment berms. Hazardous soils shall be transported off site in accordance with the governing regulations to a facility approved by Metro-North as quickly as possible. Excavation spoils should be tested, transported, reused/backfilled or disposed offsite in accordance with Section 02 61 00.

D. The Contractor shall:
1. Install 6 MIL plastic under stockpile and surround with silt fence.
2. At the end of each work day, the soil stockpile shall be completely covered with a minimum of 10-mil or 2 layers of 6-mil Polyethylene sheeting or equivalent as approved by the Engineer. Covers shall be overlapped and weighted and secured by appropriate means to prevent tearing or removal by weather conditions.
3. If the stockpile is to remain for more than 14 days, it shall be stabilized with burlap matting or seeded within 7 days of completion to minimize erosion.

3.4 DISPOSAL OF NON-HAZARDOUS PETROLEUM CONTAMINATED, NON-PETROLEUM CONTAMINATED INDUSTRIAL AND HAZARDOUS MATERIAL

A. Work Included:
1. Under this Contract, the Contractor shall provide all labor, equipment and material

necessary to transport all non-hazardous petroleum contaminated, non-petroleum-contaminated, industrial, and hazardous material or fill from the project site to the approved stockpiling and/or disposal facility (ies) and the disposal of the material at the facility (ies).

2. The Contractor shall contract only with approved licensed transport and disposal facility (ies). The facility (ies) must be able to treat and/or dispose of all of the material excavated from the site within the allotted Contract time. The facility (ies) ability to accept the material should not limit the rate at which the Contractor can excavate and transport the material. The Contractor must submit the name of the chosen disposal facility (ies) with all pertinent information and certifications to the Engineer for review and approval before the work begins.
3. The Contractor may choose to use more than one facility to transport and/or dispose to any excavated regulated material. In this case, each facility must be in compliance with the above regulations and each must have the ability to stabilize as well as dispose of the material.

B. Coordination:
1. The Contractor shall coordinate the loading, transport and disposal of the soils.
2. The Contractor shall review the tasks required under other sections and contracts and coordinate them with the work specified herein.
3. The Contractor shall notify Metro-North Railroad Force Account, if any, in advance of the work included herein providing them with sufficient time for installation and coordination of interrelated items that are included in their work and that must be completed in conjunction with the work included in this Contract.

C. Standards:
1. The Contractor shall comply with all applicable regulatory requirements, including revisions to date of Contract.

D. Requirements of Regulatory Agencies:
1. The Contractor shall comply with all applicable rules and regulations, including the applicable provisions of the following regulatory agencies:
   a. Federal DOT
   b. NYSDOT
   c. WCDOH
   d. MTA
   e. NYSDEC
   f. OSHA
   g. USEPA

2. The Contractor shall comply with New York Solid Waste Regulations: 6 NYCRR Part 360

E. Permits:

1. The Contractor shall obtain and pay for all required permits, fees and inspections by authorities having jurisdiction.

F. Disposal Facility Records:
1. The trucks loaded with regulated material and fill will be weighed at an approved scale. The truck will be weighed again once it arrives at the disposal facility. The disposal facility will complete the waste manifest or bill of lading (as applicable) and, if necessary, mail all

copies to the appropriate regulatory agencies. A copy of the completed manifest, with the truck weight taken at the disposal facility scale and a copy of the scale weight from the independent scale located near the project, shall be mailed directly to the Engineer for transmission to the Environmental Compliance Department. A Certificate of Disposal shall be mailed to the Engineer once disposal is completed.

3.5 SUPPORT OF EXCAVATIONS

A. All excavations shall be sloped or braced as needed to maintain stability during construction and be in compliance with OSHA regulations.

3.6 REMOVAL OF WATER FROM EXCAVATIONS

A. Standing water from surface runoff in excavations shall be removed prior to continuing the excavation. Pump water to a designated location. Water which contains fines shall be passed through a sedimentation basin or discharged within an approved area enclosed by silt fence or hay bales as needed to meet sediment and erosion control requirements. Water entering excavations from seepage, shall be intercepted by perimeter trenches to avoid subgrade disturbance and discharged as for surface water. If water is suspected of containing contamination, water shall be stored in portable tanks for testing. Dewatering system requirement shall be in accordance with Section 31 23 19.

3.7 UTILITY TRENCHING AND TEST PITS

A. Excavate trenches to the depth indicated on the drawings to establish the utilities at the required invert elevations. Support trench walls as needed to install pipe bedding and utilities. Segregate unsuitable excavated materials from soil suitable for utility backfill. Active utilities damaged by the Contractor's operation shall be repaired or replaced at no expense to Metro-North.

B. Utilities depicted on the plans are based on available information. The Contractor shall dig test-pits as necessary to confirm existing utility locations. If utility locations or unidentified utilities are encountered, the Contractor shall immediately inform Metro-North and the Engineer.

C. Utility Trench Backfilling:

1. Do not backfill trenches until all tests on installed utilities have been performed and utility installation approved. Place and compact the specified pipe bedding material below the utility invert to the springline of the utility in layers not to exceed 6 inches per layer. Compaction of pipe bedding material shall be with approved compaction equipment making a minimum of five complete coverages. After utility installation is approved, place Utility Trench Backfill to final grade or surplus material or to subgrade for pavement where applicable. The Contractor shall provide a standard vinyl tell-tale warning strip 1' above the top of all underground utilities. The strip shall be universally color coded for the specific utility (Red = Electric, Blue = Water, etc.) which it protects.

D. Utility backfill shall be placed in lifts compatible with the compaction equipment used: 6 inches loose lifts for hand operated tampers and 9 inch loose lifts for self-propelled walk behind type rollers. A minimum of five complete coverages of the compactor shall be performed and until compaction indentations disappear, indicating compaction is completed. Do not place stones adjacent to the utility. Place backfill in a manner that will not unbalance the load on the utility. Testing will be performed visually and by quantitative methods to verify adequate compaction.

Where utility trenches are below paved sections, compaction will be a minimum of 95% Modified proctor maximum dry density.

E. Install a color coded plastic utility warning tape 12” below finished grade along the centerline(s) of the utilities (pipes, duct banks, conduits, etc.).

3.8 COMPACTION REQUIREMENTS

A. Subbase shall be compacted in accordance with NYSDOT Standard Specifications Section 304. Lifts shall not exceed 6” maximum.

B. Fill shall be compacted to a density of not less than 95 percent of the maximum dry density as determined by ASTM D1557, Method C. Lift thickness shall not exceed NYSDOT criteria based on the equipment utilized by the contractor as per NYSDOT Standard Specifications Section 203 (Latest Revision).

C. Structural and random fill areas shall be as designated on the Contract drawings.

D. Each layer of fill shall be compacted by at least four passes of the drum or plate over the entire surface of the layer.

E. Compaction by means of drop weights operating from a crane or hoist will not be permitted.

F. Fill compacted at densities lower than the specified minimum density or otherwise not conforming to the requirements of this specification shall be reworked or removed and replaced by filling conforming to all requirements of this specification.

G. Fill beneath any foundation shall be compacted in uniform horizontal layers by means of heavy vibratory compactors or hand-operated compactors. Successive blows of the compactor shall overlap no less than 1/4 of the width of the drum or plate. Each layer shall be compacted when necessary to ensure the maximum density obtainable.

H. In the event that the use of heavy compaction equipment results in loosening of the surface layer of fill, the top surface of fill shall be re-compacted using light vibratory compactors or hand operated compactors prior to placement of concrete.

I. Fill adjacent to structures shall be compacted by means of light vibratory compactors or hand-operated compactors. Heavy vibratory compactors shall not be operated so close to any structure to affect any damage.

J. Where equipment clearances, the protection of structures, or other space restrictions prevent the use of heavy vibratory compactors, the fill shall be compacted with light vibratory compactors or hand-operated compactors. When compaction specifications cannot be met, the lift thickness shall be reduced at the direction of the Engineer in order to obtain the specified minimum density.

K. Fill placed under the haunch of an item, (such as conduit, piping, or tanks), shall be compacted to the spring line using hand-operated compactors. Subsequent layers above the springline of the item to a height at least 24 inches above the top of the item shall be compacted with hand-operated compactors or light vibratory compactors. The remaining portion of the backfill shall be compacted with heavy vibratory equipment. Passage of heavy vibratory compactors will not be allowed over any conduit, piping or tanks until the fill has been placed at least 24 inches above the top surface of the item.

L. Damage or displacement of any item by hauling equipment or by dumped material shall be avoided.

M. Compaction test results shall be documented and submitted to the Engineer.

3.9 FINAL GRADING

A. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas, Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades.

B. Grade areas adjacent to structures and building lines such as to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes and as follows:

1. Lawn or Unpaved Areas: Finish area to receive topsoil to within not more than 0.10-foot above or below required subgrade elevation.
2. Walks: Shape surface of areas under walk to line, grade, and cross-section, with finish surface not more than 0.10-foot above or below required subgrade elevation.

Pavements: Shape surface of areas under pavement to line, grade, and cross-section, with finish surface not more than 1/2-inch above or below required subgrade elevation.

3. Surface of Gravel Fill under Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2-inch when tested with a 10-foot straightedge.

C. The Contractor is to disperse excess excavation at each station as determined by the engineer in conjunction with Metro-North.

3.10 TOP SOIL

A. PREPARATION

1. Contractor shall prepare ground surface to receive Topsoil by loosening the surface with hand tools so as to avoid a "hard-pan" soil horizon below the newly-placed topsoil. Preparation shall include removal of sod and grass areas, and other undesirable vegetation, by methods approved by the Engineer. Surplus materials from such preparation shall be disposed of legally, off-site, the cost of which shall be deemed included in this item.
2. Topsoil shall be 2” depth.

B. MAINTENANCE

1. The Contractor shall maintain all topsoil areas until acceptance of the contract. Maintenance shall include the installation of temporary sediment and erosion control measures to protect storm water systems and adjacent water bodies from sediment loading which, in the opinion of the Engineer, has been caused by the Contractor's operations.

C. GRADING

1. Contractor shall bring site to line and grade indicated on the drawings. Grading and movement of topsoil shall be deemed included in the cost of this item. Contractor shall submit to the Design Staff schedule of machinery and proposed method of grading for approval. Topsoil shall be initially piled in a staging area adjacent to the area to be filled, and shall be spread so that approved equipment shall limit compaction.

D. DELIVERY, STORAGE AND HANDLING

1. No topsoil shall be delivered in a frozen or muddy condition or handled with a moisture content in excess of forty (40%) percent. Topsoil shall be stockpiled in an approved location on-site to limit excess handling of material and contamination with excavated material and construction debris. No topsoil shall be stockpiled or spread within the drip line of trees.

E. PROJECT SITE CONDITIONS

1. No work shall occur before the soil moisture content of both the existing subsoil and topsoil material delivered to the site has been approved by the Engineer.

3.11 INSTALLATION OF EROSION CONTROL MAT

A. Prior to installation, the Contractor shall confirm that the area of work has been graded to the proper lines and grades as indicated in the plans and specifications, and to the satisfaction of the Engineer. Fabric shall be laid on top of new topsoil. The fabric shall be placed parallel to the slope loosely without stretching on the soil, so that it is in contact with the soil at all points, and then pressed firmly into the soil surface by rolling or tamping by hand. Rows of fabric shall be overlapped a minimum of 6 inches with the higher edge of the Erosion Control Blanket overlapping the lower edge.

B. Erosion Control Blanket shall unroll to its full width and length, anchored at its ends as well as at every one foot (1’-0”) O.C. maximum. Erosion Control Blanket shall be anchored with “Ecostakes”. The fabric shall be held tightly to the soil by positioning stakes approximately 3 feet apart (3 per square yard of fabric, domino pattern). The stakes shall not be more than 1 foot apart at roll ends, check slots, and critical areas, as determined by the Engineer. The stakes shall be driven until all but 1 inch of crown is in the ground. Excess fabric shall be cut away and the top edge trenched and buried to a depth of 6 inches and anchored with stakes.

C. Where directed by the Engineer, the Contractor shall cut holes in the fabric to account for new or existing plantings, boulders, and/or other site elements which would interrupt a smooth and consistent placing of the mesh.

3.12 SITE CLEANUP OF EARTHWORK OPERATIONS

A. Remove all excess spoils, accumulated sediments, silt fencing and construction debris to the satisfaction of the Engineer.

END OF SECTION

SECTION 31 11 00 - CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The Contractor shall provide all labor, tools, equipment, materials and incidental items required to perform site clearing of all areas within the Contract limits and other areas shown on the Contract Drawings, including work designated in permits and other agreements.

1.2 RELATED WORK

A. Section 01 74 19 Construction Waste Management and Disposal

B. Section 02 61 00 Sampling, Testing, Handling, Removal And Disposal of Soils

C. Section 31 25 00 Erosion and Sedimentation Controls

1.3 SUBMITTALS

A. Submit to the Engineer for approval a detailed demolition plan for any structures to be removed. The plan shall indicate the methods to be employed, procedures, equipment, removal sequence, protection of Railroad operations and the public and the location and disposition of salvageable items.

B. Submit safety and protection measures including signs, barriers, temporary walkways, tree protection details, and any other required safety measures.

C. Submit location(s) of authorized dumpsites to be utilized.

1.4 PROJECT CONDITIONS

A. General: The Contractor shall inspect existing conditions where work of this section is to be performed. The Contractor shall take note of all conditions that will affect the execution of the work, including but not limited to dimensions of existing structures, clearances, access, shoring and protection required.

B. Support and Protection: The Contractor shall provide and maintain all required temporary construction and facilities for the adequate support and protection of portions of the existing adjacent structures that are to remain.

C. Job Conditions: To minimize work interruptions, make provisions to ensure that spare parts for removal equipment and a qualified mechanic are available from a local distributor of the equipment.

D. Explosives: The use of explosives for demolition is prohibited.

1.5 REGULATORY REQUIREMENTS

A. Work shall be performed in accordance with the latest edition and addenda thereto of the following:
   1. Applicable provisions of the Occupational Safety and Health Standards of the U.S. Department of Labor.
   2. Comply with American National Standards Institute (ANSI) Standard A.10.6 - Safety Requirements for Demolition.

B. In the event of any conflict between these specifications and referenced codes, the most stringent requirements as determined by the Engineer shall be followed.

C. Obtain required permits from all authorities.

D. Conform to procedures applicable when discovering hazardous or contaminated materials.

E. Contractor shall employ all safe work practices and document procedures.

1.6 DEFINITIONS

A. Clearing: Clearing is the removal from the ground surface and disposal, within the designated areas, of topsoil, trees, brush, shrubs, down timber, decayed wood, other vegetation, rubbish, trash, scrap, metal, debris and miscellaneous other structures not covered under other Sections as shown on the Contract Drawings, specified or otherwise required to permit construction of the new Work.

B. Grubbing: Grubbing is the removal and disposal of all stumps, buried logs, roots larger than 2 inches, matted roots and organic materials.

1.7 QUALITY ASSURANCE

A. Codes and Standards: State and local laws and code requirements shall govern the hauling and disposal of trees, shrubs, stumps, roots, rubbish, debris and other matter.

1.8 PROJECT/SITE CONDITIONS

A. Streets, roads, adjacent property and other works and structures shall be protected throughout the entire project. Contractor shall return to original condition, satisfactory to the Engineer, facilities damaged by the Contractor's operations.

1.9 GUARANTEE

A. The Contractor shall guarantee that work performed under this Section will not permanently damage trees, shrubs, turf or plants designated to remain, or other adjacent work or facilities. If damage resulting from Contractor's operations appears during the period up to 12 months after completion of the project the contractor shall replace damaged items at no additional expense to the Metro North.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TREES AND SHRUBS TO BE SAVED

B. Protection: The Contractor shall protect from defacement, injury and destruction all trees and shrubs within the construction site that are so delineated or are marked in the field to be saved. Trees, shrubs and grassed areas which are to remain shall be protected by fences, barricades, wrapping or other methods as shown on the Contract Drawings, specified or approved by the Engineer.

1. Within the limits of the tree drip line, work shall be performed with extreme care using either hand tools or equipment that will not cause damage to trees. The Contractor shall have a licensed Arborist available on-call to respond to the site as requested by the engineer and provide opinion relative to the condition, protection, pruning, or removal of any vegetation on the site.
    a. Do not disturb or cut roots unnecessarily. Do not cut roots 2 inches and larger unless approved.
    b. Immediately backfill around tree roots after completion of construction in the vicinity of trees.
    c. Do not operate any wheeled or tracked equipment within drip line.
    d. Do not store vehicles or heavy equipment within the drip line.
2. Vegetation shall be protected from damage caused by emissions from engine-powered equipment.
3. During working operations, the trunk, foliage and root system of all trees to be saved shall be protected with boards or other guards placed as shown on the Contract Drawings and as required to prevent damage, injury and defacement.
    e. Excavated materials shall not be piled within the drip line or adjacent to the trunks of trees. Equipment, stockpiles, etc. shall not be permitted within the drip line.
    f. Do not allow runoff to accumulate around trunks of trees.
    g. Ropes, cables, or guy wires shall not be fastened or attached to trees without permission. When such permission is granted, protect the tree before making fastening or attachments by providing burlap wrapping and softwood cleats.
    h. The use of axes or climbing spurs for trimming will not be permitted.
    i. Provide climbing ropes during trimming.
4. Shrubs to be saved shall be removed by taking a sufficient earth ball with the roots to maintain the shrub.
    j. Temporarily replant, if required, and replace at the completion of construction in a condition equaling that which existed prior to removal.
    k. Replace in kind if the transplant fails. Provide transplanting, planting, and watering and guarantee.
5. Any tree and shrub repair shall be performed by a tree surgeon properly licensed by the State of New York and within 24 hours after damage occurred.
6. Trees and shrubs intended to remain which are removed or damaged beyond repair shall be replaced by the Contractor.
7. The Contractor shall replace all trees which are removed with a species and aggregate Caliper at locations or the site as ordered by the Engineer.

3.2 TREE AND SHRUB REMOVAL

A. Tree Removal Within Property Limits:
   1. Trees and shrubs within the construction limit lines shall be removed as indicated on the plans. Remaining trees and shrubs shall be trimmed. Trimmed or damaged trees shall be treated and repaired by persons with experience in this specialty who are approved by the Engineer.
   2. Tree and shrub removal shall be conducted in a manner so as to avoid damage to those trees and shrubs which will remain.
   3. Do not cut or damage trees or shrubs outside of the Contract limit lines. Damage outside the Contract limit lines caused by the Contractor's operations shall be corrected at the Contractor's expense.

B. Tree Removal outside Property Limits: The Contractor shall not cut or damage trees outside the property limits. Damage outside the property limits caused by the Contractor's operations shall be corrected at the Contractor's expense.

3.3 CLEARING AND GRUBBING

A. Clearing: The Contractor shall clear all items specified to the Contract limit lines shown on the Contract Drawings and shall remove cleared and grubbed materials from the site to an authorized disposal site.
   1. Do not start earthwork operations in areas where clearing and grubbing is not complete, except that stumps and large roots may be removed concurrent with excavation.
   2. Comply with erosion and sedimentation control measures as specified in Section 31 25 00

B. Grubbing: The Contractor shall clear and grub areas to be excavated, areas receiving less than 3 feet of fill and areas upon which structures are to be constructed.
   1. Stumps and root mats in these areas shall be removed to a depth of not less than one (1) foot below the subgrade of sloped surfaces.
   2. All depressions made by the removal of stumps or roots shall be filled with material suitable for backfill.

C. Limited Clearing: The Contractor shall clear areas receiving more than 3 feet of fill by cutting trees and shrubs as close as practical to the existing ground. Grubbing will not be required.

D. Burning:
   1. Burning of cleared and grubbed materials is not allowed.

E. Explosives shall not be used.

F. No cleared or grubbed material may be used in backfills or structural embankments.

G. Cleared and grubbed items shall become property of the Contractor and shall be removed from the site and satisfactorily disposed of.

H. Air pollution caused by dust and dirt shall be controlled, complying with governing regulations.

3.4 REPAIRS

A. Structures and other appurtenances damaged by the demolition and removal operations shall be repaired as directed by the Engineer. All necessary final clean-up of the site shall be performed.

END OF SECTION

SECTION 31 23 16.26 - ROCK REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, and services necessary for, and incidental to, the excavation, removal and disposal of rock as required to construct the Work of this Contract as shown on the Drawings, and as herein specified, including the preparation of the site, protection, excavation, surface drainage, de-watering, and removal of material from the site and disposal as required by these specifications and as ordered by the Engineer.

B. Excavated rock, or abandoned concrete and masonry other than foundations to be eliminated as identified on the plans shall be removed and legally disposed of off-site by the Contractor at the Contractor's Expense.

C. The work in this section includes drilling, hammer chiseling, excavation, removal and disposal of rock. Blasting methods for excavation of rock are not permitted.

D. Locations of known underground utilities shown on the drawings are approximate, only. The Contractor shall be responsible for determining the exact locations of underground utilities, their proximity to the construction, and for the protection and repair of these utilities, prior to excavation.

1.2 REFERENCES AND RELATED WORK

A. The latest edition of the following standards, as referenced herein, shall be applicable.
1. "Structure Response and Damage Produced by Ground Vibration from Surface Mine hammer/chiseling," U.S. Bureau of Mines Publication RI 8507.
2. Section 01 74 19 Construction Waste Management and Disposal
3. Section 02 61 00 Sampling, Testing, Handling, Removal And Disposal of Soils
4. Section 31 20 00 Earth Moving
5. Section 31 25 00 Erosion and Sedimentation Controls

1.3 DEFINITIONS

A. Rock: Unforeseen features not shown on plans or specified to be removed that consists of Limestone, sandstone, shale, granite, quartz, and formations of other varying mineral or aggregate composition in solid beds or masses in its original or stratified position including boulders with a volume greater than 2 cubic yards in open areas, 1 cubic yard in trenches; masonry or concrete with similar minimum sizes, that cannot be broken or removed by typical earth excavation equipment such as a Caterpillar 315 excavator with a toothed bucket, or a John Deere 120 D excavator with a toothed bucket. Material that cannot be removed with equipment meeting this minimum digging force will constitute as rock.

B. Rock Excavation: Removal of rock by means of drilling, hammering, dynamic chiseling, or use of pneumatic tools or expansive chemical agents. Removal of rock by means of blasting is prohibited.

C. Earth Excavation: Removal of materials which, in the opinion of the Engineer, can be loosened and excavated with a pick, backhoe, or other mechanical means (ripping, etc.) by a Caterpillar 315 excavator with a toothed bucket, or a John Deere 120 D excavator with a toothed bucket or smaller shall be classified as earth excavation. Earth excavation shall also include frozen materials, soft laminated shale, hardpan, rock face scaling, pavements, curbs, concrete sidewalks, and other similar materials of hardness and density.

D. Unauthorized Excavation: Removal of any material beyond horizontal and vertical limits indicated on the Drawings or as specified herein, without the prior approval of the Engineer.

E. Scaling: Scaling shall be considered the removal of loose and broken rock from the face of rock cuts by mechanical means. Scaling shall be included in the Earth Excavation item as defined above, If in the opinion of the engineer scaling cannot be performed in a satisfactory manner with a Caterpillar 315 excavator with a toothed bucket, or a John Deere 120 D excavator with a toothed bucket or smaller excavator and requires the use of larger equipment than scaling shall be classified as Rock Excavation.

F. Independent Specialty Condition Surveyor: A subcontractor approved by the Engineer retained by the Contractor to perform pre and post hammer/chisel surveys of elevations.

G. Independent Specialty Seismic Condition Survey Contractor: A subcontractor if required by the Engineer retained by the Design Builder to perform pre and post condition surveys of the nearby structures (within one hundred twenty five feet of the hammering operations). This specialty contractor shall also perform seismic vibration monitoring on-site and if required off-site at locations specified or designated by the Engineer.

H. Pre-splitting: A controlled drilling method in which a smooth excavation face is created by simultaneously drilling a single row of closely spaced holes along the excavation line prior to hammer/chiseling the remainder of the holes in the hammer/chisel pattern. Pre-splitting hammer/chisel holes shall be a minimum of 3 inches diameter at a center-to-center spacing not exceeding 24 inches.

1.4 SUBMITTALS

A. GENERAL

1. Submit work plans, site safety plans, and a detailed outline of intended rock removal procedures and any other information listed in this specification to the Engineer for approval. This submittal shall not relieve the Contractor of complete responsibility for the successful performance of the method(s) used.
2. Submit proposed equipment, with detailed catalog cuts clearly outlining operating weights, and digging forces of all intended rock removal equipment, drill excavators, trucks and any other information listed in this specification to the Engineer for approval. This submittal shall not relieve the Contractor of complete responsibility for the successful performance of the method(s) used.
3. Prior to rock removal operations submit the Specialty Contractors' qualifications, and available lead times to the Engineer in the event the services are required. The engineer will review for approval. On site conditions and the contractor's proposed rock removal equipment will determine the necessity of this specialty contractor. Submit proposed monitoring equipment, and a detailed outline of intended monitoring procedures and any other information listed in this specification to the Engineer for approval.

4. Vibration Monitoring Plan to document vibrations during removal to ensure maximum limits are not exceeded.

B. LOG OF COMPLAINTS
1. A log of all complaints and responses resulting from hammering operations shall be kept by the Contractor's designated contact person. The log should include, as a minimum, the following information: name and address of person registering complaint/inquiry; time and date when annoyance occurred; time and date when complaint/inquiry filed; nature of complaint/inquiry; action taken by contact person; follow-up action. A copy of all complaints and responses shall be submitted to the Metro-North and Engineer by the following work day.

C. SITE SAFETY PLAN
1. Site safety shall be coordinated through the Contractor's office. A written safety plan shall be developed and distributed to all subcontractors, the Metro-North and the Engineer.

1.5 REGULATORY REQUIREMENTS

A. The hammer/chiseling Contractor shall obtain all required permits, certificates, and licenses prior to the commencement of any hammer/chiseling operations.

B. Hammer/chiseling safety procedures and operations shall comply with Title 29 Code of Federal Regulations Part 1910.109, (New York State Regulations Part 12 NYCRR39) and all other applicable state standards and regulations.

1.6 PROJECT SITE CONDITIONS

A. Existing Conditions: Existing physical conditions as defined for design purposes are noted on the Drawings. The Contractor shall verify all field conditions prior to construction in accordance with the Contract Documents. Provide detailed video or photos of adjacent properties or structures taken prior to rock excavation or removal activities to verify site conditions.

1.7 SEQUENCING AND SCHEDULING

A. Work associated with hammer/chiseling shall be performed in accordance with the following general sequence:
1. Complete and submit pre-hammer/chisel survey to establish elevations;
2. If required complete and submit pre-hammer/chisel inspections. Inspections shall be performed by the specialty contractor.
3. Notify all appropriate authorities having jurisdiction of proposed activities;
4. Prepare site for hammer/chiseling;
5. Notify affected utility owners, operators and nearby residents as required in Part 3 - Execution;
6. Complete test hammer/chisel program simultaneously with seismic monitoring;
7. Complete production hammer/chiseling work simultaneously with seismic monitoring (if required).
8. Complete and submit post-hammer/chisel survey to establish final elevations.
9. If required complete and submit post hammer/chisel building inspections. Inspections shall be performed by the specialty contractor.

1.8 MAINTENANCE

A. Any and all damage caused by the hammer/chiseling operations shall be repaired or replaced to the property Owner's and Engineer's satisfaction at the expense of the hammer/chiseling Specialty Contractor within thirty (30) days of completion of the Post-hammer/chisel Survey.

1.9 COORDINATION

A. The Contractor will be required to coordinate hammer/chiseling work within 100 feet, and all rock removal within 40 feet of the closest Metro-North Railroad rail to insure that all train movements are properly prepared for. Neither hammer/chiseling nor rock removal operations shall interfere with the safe passage of trains.

B. Metro-North will station a flag\person at appropriate locations on their facilities during all hammer/chiseling operations, and the Contractor will be responsible to properly coordinate with Metro-North.

C. If required during hammer/chiseling and material removal operations, the Contractor shall provide and install 1-inch thick steel road plates to protect tracks and the right of way road from falling debris. The area shall be restored to allow train operations as per the track outage schedule and per the restriction in Section 01 11 01 Work Affecting the Railroad.

PART 2 - PRODUCTS (Section not used)

PART 3 - EXECUTION

3.1 ROCK REMOVAL

A. Remove rock to install foundations and to construct the grades as indicated by the Drawings.

B. Fill areas of over excavated rock to the proposed subgrade elevations as required with approved backfill materials specified in the contract documents. Over excavation below specified grades shall be filled as approved by the Engineer.

C. A test hammer/chisel shall be performed and monitored prior to commencement of production hammer/chiseling. Test hammer/chisel records and seismic records shall be reported to the Engineer prior to continuation of hammer/chiseling. If test hammer/chisel indicates that the hammer/chiseling plan requires modification, such changes shall be reported to the Engineer immediately. Reporting this information to the Engineer shall not relieve the Contractor(s) of complete responsibility for the successful performance of the method(s) used, nor shall the reporting constitute approval by the Engineer for the proposed plans.

D. The Seismic Specialty Contractor shall monitor the vibrations and sound levels caused by hammer/chiseling. Seismic monitoring shall be performed for each hammer/chisel operation, unless specified otherwise. Monitoring shall be performed at the nearest structure or at locations designated by the Engineer on each field day.

E. If the ground vibrations exceed specified tolerances the hammer/chiseling Specialty Contractor's operations shall cease immediately and remain stopped until the hammer/chiseling Specialty Contractor has taken all necessary additional measures to protect adjacent property and personnel.

3.2 EXCAVATION TOLERANCES

A. Rock removal limits shall include all materials defined as rock, whether removal is accomplished by mechanical means or by drilling and hammer/chiseling. Payment limits for rock removal shall be as noted on the Drawings or as necessary to safely excavate, in accordance with MNR standards, including but not limited to stair and ramp foundations, column foundations and overpass support foundations.

B. This work shall be based upon the cubic yards of rock removed only within the footprint of the foundation being constructed and shall be measured in place prior to removal

3.3 VIBRATION AND SOUND TOLERANCES

A. Hammer/chisel vibrations shall be maintained within safe limits as defined by the Peak Particle Velocity (in/sec) vs. hammer/chisel Frequency (Hz) as described in the United States Bureau of Mines Publication RT-85 07, Appendix B ("Siskind Curve").

B. Sound levels shall not exceed 128 db at the nearest structure.

C. Vibration levels at new concrete structures shall be limited to the following levels:

Age of Concrete (days)	Maximum Allowable PPV
less than ½	0.1 ips
½ to7	1.0 ips
greater than 7	2.0 ips

END OF SECTION

SECTION 31 23 19 - DEWATERING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Requirements for dewatering systems for treatment of groundwater before discharge to the on-site treatment system or Combine Sewer System.

B. The work shall consist of controlling, handling, treating and disposing of groundwater during dewatering activities.

C. Dewatering effluent will be allowed to discharge to an on-site self-contained frac tank provided by the Contractor. The frac tank must include a settling or other 'treatment' system sufficient to allow the removal of contaminants to the extent that the discharged water meets NYSDEC requirements as applicable.

D. If groundwater goes off site for disposal, no treatment is required. All transporters and disposal sites used must be approved by the Engineer, and Metro-North Department of Environmental Compliance and Services.

E. The use of an on-site treatment system requires approval by the Engineer and Metro-North Department of Environmental Compliance and Services.

F. All groundwater removed from excavations, including that generated during initial dewatering, shall at a minimum, treated to minimize sediment and settleable solids.

1.2 RELATED WORK:

A. Section 01 74 19 Construction Waste Management and Disposal

B. Section 01 74 19 Testing, Removal and Disposal of Soil

C. Section 31 20 00 Earth Moving

D. Section 31 23 16.26 Rock Removal

E. Section 31 25 00 Erosion and Sedimentation Controls

1.3 STANDARDS AND REGULATIONS:

A. New York State Department of Environmental Conservation (NYSDEC):

B. State Pollutant Discharge Elimination System (SPDES) Discharge Permit. (not applicable).

C. United States Department of Labor (USDOL), Occupational Safety and Health Administration (OSHA), Title 29, Code of Federal Regulations (CFR):
   1. 29 CFR 1910 – Occupational Safety and Health Standards

D. Metro-North Commuter Railroad Company Standards, Technical Provisions for Environmental Engineering Controls for Petroleum Contaminated Soils and Water.

E. Westchester County Department of Environmental Facilities (WCDEF) Wastewater Discharge Permit (if applicable).

F. Metro-North Commuter Railroad Company – OCIP Contract Safety Specifications.

1.4 NOTED RESTRICTIONS: (Not used)

1.5 QUALITY CONTROL:

A. Verify groundwater treatment systems meet discharge permit requirements.

B. Verify compliance with referenced standards and regulations.

C. Contractor shall be liable for all damage claims by Metro-North and local Municipality due to regulatory dewatering flow exceedance.

1.6 SUBMITTALS:

A. Groundwater Treatment System Schematic Diagram and Design Calculations for all system components, processes, and removals.

B. Groundwater Treatment System Shop Drawings and Catalog Cuts.

C. Operation and Maintenance (O&M) Plan may include provisions for removal of settled solids from sedimentation (frac) tanks, replacement of bag filters, carbon servicing, and general system cleaning to remove scaling, deposits, etc.

D. Environmental Emergency Response Plan, and Environmental Protection, pursuant to OSHA 29 CFR 1910.120 specific to the operation and maintenance of groundwater treatment systems which may include provisions for: handling and cleaning bag filters; and confined space entry (cleaning of sedimentation tanks) with written verification by Certified Industrial Hygienist (CIH) approving the SHECP.

E. Groundwater Treatment System Monitoring Plan shall include methods for sample collection and analysis from the end point of various treatment system components to assess treatment component removal efficiency as referenced in Articles 3.4 and 3.5.

F. Qualifications, applicable up-to-date licenses, and safety certificates for all treatment system operators, waste handling Contractor, and waste receiving facilities.

G. Obtain approval from all regulatory agencies having jurisdiction before full construction service activation.

H. All submittals are to be in accordance with Section 01 33 0 Submittal Procedures.

1.7 DELIVERABLES:

A. Submit to Metro-North's Environmental Compliance Department all completed permit applications necessary to conduct dewatering, groundwater treatment, and discharge of dewatering effluent.

B. Bills of Lading for disposal of settled solids.

C. Documented daily volume of dewatering discharge to the on-site treatment plant, if used.

PART 2 - PRODUCTS

2.1 GENERAL:

A. The groundwater treatment system shall consist of gravity sedimentation tanks, filtration, or other industry accepted treatment system components necessary to meet applicable discharge limits established in the Metro-North SPDES permit, and WCDEF Wastewater Discharge Permit, a separate dewatering SPDES permit obtained by the Contractor, or other permits as applicable.

B. Power and water supply required for system servicing.

C. Piping and all other accessories to convey groundwater from the Project site to the treatment system and discharge location.

D. Control panels, as needed, for the treatment system and associated pumps.

E. All valves, sampling ports, meters, gauges, and controls to maintain adequate flow rates and treatment efficiency and to document discharge volume.

F. All equipment shall be designed for its intended use in a potentially wet and hazardous environment, for potential contact with petroleum substances, and presence of stray electrical current.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Submit the information required in the special condition section of the permit.

B. Design, install, operate, and maintain a groundwater treatment system to reduce identified contaminant concentrations to required levels stipulated in applicable discharge permit(s) from the NYSDEC, Westchester County Department of Environmental Facilities, or others as applicable.

3.2 DESIGN:

A. Design of the groundwater treatment system shall be based upon site-specific data and an industry accepted treatment scheme to address site-specific contaminated groundwater.

B. Design the groundwater treatment system to meet discharge criteria as stipulated in the applicable NYSDEC, WCDEF discharge (and/or effluent limitations) permits or others as applicable and supplemental requirements as may be stipulated in these permit(s).

C. Design the groundwater treatment system to operate continuously, without interruption and provide adequate removal efficiency to meet the permit requirements.

D. Dewatering shall be piped directly to sedimentation tanks and the use of open settling ponds are not permitted.

E. Verify installation complies with manufacturer's instructions and standards.

F. The design shall also consider the presence of various metal compounds in the groundwater.

G. At a minimum, the design shall incorporate meters, gauges, and sampling ports for the measurement of flow rate, total flow, operating pressures, and influent and effluent concentrations.

H. The design shall also incorporate adequate ventilation systems in the excavation area for potential volatilization of contaminants from sumps and seepage.

3.3 INSTALLATION:

A. The groundwater treatment system and associated components shall be located, operated and maintained such that all utilities within the area shall be protected from damage.

B. Protect all benchmarks, survey control points, boring locations, monitoring wells, and piezometers from damage or displacement during dewatering storage and groundwater treatment activities at the Project site.

C. Protect any on-site drainage basins, outfalls and connections thereto from damage, accumulation of silts, sediments or other solids from groundwater conveyed within or discharged from the Project site in accordance with Section 31 25 00 Erosion and Sedimentation Controls.

D. Signs shall be posted with emergency contact information in the event of system failure or malfunction.

E. All system components, piping, and connections shall be water and vapor tight.

3.4 START-UP AND TESTING:

A. Start the groundwater treatment system in accordance with manufacturer's operating procedures, design considerations, and applicable permit requirements.

B. Conduct initial treatment system testing to verify compliance with discharge limitations.

C. The air shall be monitored for oxygen levels and potential contaminant concentrations to assure adequate ventilation system operation.

3.5 OPERATION:

A. Operate the groundwater treatment system in accordance with manufacturer's operating procedures, design considerations, and applicable permit requirements.

B. Keep a Groundwater Treatment System Log Book to include all measurements of system performance such as operating pressures, temperatures, influent, mid-fluent, and effluent concentrations, and flow rates and volumes.

C. Provide the requisite personnel with appropriate training and certification to operate the groundwater treatment system as required in the discharge permit(s).

D. Maintain the treatment system and its various components in accordance with the manufacturers' recommended maintenance routines and procedures.

E. Inspect system components daily for the presence of oil, ice, settled solids accumulation, flow rates, pressures, and effluent color and appearance.

F. Additional treatment components shall be installed and operated as necessary to maintain the flow rates necessary for de-watering and to assure compliance with the effluent limitations.

G. In the event pre-finishing component concentrations meet the discharge limits; bypass of these system components shall be conducted.

END OF SECTION

SECTION 31 23 23 - COMPACTION TESTING AND INSPECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide laboratory compaction testing.

B. Provide laboratory gradation testing.

C. Provide field density testing.

1.2 RELATED SECTIONS

A. Section 01 43 00 – Quality Assurance

B. Section 01 45 29 – Testing Laboratory Services

C. Section 31 00 00 – Earth Moving

D. Section 32 11 00 – Base Courses

E. Section 32 12 00 – Flexible Paving

F. Section 32 16 00 – Curbs, Gutters, Sidewalks and Driveways

1.3 REFERENCES

A. ASTM D422 – Particle Size Analysis of Soils

B. ASTM D698 – Moisture-Density Relations of Soils and Soil Aggregate Mixtures using 5.5 lb. Rammer and 12-inch Drop

C. ASTM D1556 – Density of Soil in Place by the Sand-Cone Method

D. ASTM D1557 – Test Methods for Moisture-Density Relations of Soils ad Soil Aggregate Mixtures Using 10 lb. Rammer and 18-inch Drop

E. ASTM D6938-10 – Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)

1.4 TESTING SERVICES

A. The Contractor shall pay for all testing services.

B. The test services shall include:

1. Review and check/test the Contractor's proposed materials for compliance with the specifications.
2. Compaction tests of materials modified or placed by the Contractor including asphalt paving for compliance with the applicable specifications.
3. Qualifications of the proposed materials and portions.
4. Any additional testing required due to the failure of material to meet the specification requirements.
5. Any additional testing required due to the changed in the materials or proportions by the Contractor.

1.5 RESPONSIBILITIES OF THE CONTRACTOR

A. Submit at least three testing agencies to the Engineer for approval. See Section 01 45 29 for additional requirements for selection of a testing agency, testing and laboratory work.

B. Submit to the Engineer the materials and portions for use with a request for approval. This submittal shall include the results of the testing performed to qualify the material

C. Inform approved testing agency sufficiently in advance to allow reasonable mobilization time.

1.6 TESTING PROCEDURES

A. Determine the moisture-density curve for each material in accordance with ASTM D1557 or ASTM D698.

B. Determine in-place densities for materials in accordance with ASTM D1556 or ASTM D6938.
   1. Third party inspection using nuclear gauge density testing shall be required for all areas that are receiving new buildings and as required by the Engineer.

C. Determine the gradations above the number 200 sieve of each material in accordance with ASTM 422.

D. Determine the Liquid Limit and Plastic Limit, where applicable.

1.7 ACCEPTANCE CRITERIA

A. Compaction results must meet or exceed the minimum values specified. Any material or area that tests below the specified values shall be corrected and retested until it passes. All correction work shall be performed at no additional cost to Metro-North.
   1. Compaction results shall be at least 95% as per the Proctor test, in accordance with ASTM D698.

B. Gradation results shall meet all requirements specified.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 31 25 00 - EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements of temporary measures to control soil erosion and water pollution. The work must consist of furnishing, installing, maintaining, and removing haybales/straw bales, inlet filters, stabilized construction entrances, silt fence and other appropriate measures as shown on the contract documents and Best Management Practices.

B. Storm Water Program: The Contractor is required as part of the contract to obtain any and all necessary permits for storm water and/or storm water discharge from the construction site. Projects which disturb one or more acres of soil or project disturbs less than one acre but are part of a larger common plan are required to obtain coverage under the General Permit for Discharges of Storm Water Associated with Construction Activities. Construction activity subject to maintenance activities preformed to restore the original line, grade or capacity of the facility.

1.2 RELATED WORK

A. Section 01 74 19 Construction Waste Management and Disposal
B. Section 02 61 00 Sampling, Testing, Handling, Loading, Removal and Disposal of Soils
C. Section 31 20 00 Earth Moving
D. Section 31 23 16.26 Rock Removal

1.3 SUBMITTALS

A. Shop Drawings – Prior to delivery of sediment and erosion control measures, six (6) copies of the manufacturer’s catalog cuts will be submitted to the Engineer for review. Review of such submissions will not absolve the Contractor from full responsibility as to the correctness of the sediment and erosion control measures with regard to Contract Plans, Standards and Specifications.

B. Provide the Engineer with copies of required permits.

C. Contractor to provide copies of the Construction General permit for the development and implementation of the Storm Water Pollution Prevention Plan (SWPPP). The SWPPP is to be prepared in accordance with Section 402 of the Clean Water Act and the New York Storm Water Management Design Manual, and New York State Standards and Specifications for Erosion and Sediment Control.

D. Crushed Stone – One (1) 10-lb. sample bag.

E. Filter Fabric – Provide mill certification from manufacturer.

F. Mulch – Salt hay, small grain straw of wheat, rye, oats or barley free from seeds, noxious weeds and other foreign material.

1.4 QUALITY ASSURANCE

A. Soil erosion and water pollution control measures must at all times be satisfactory to the Engineer. When it becomes necessary, the Engineer will inform the Contractor of unsatisfactory construction procedures and operations. If the unsatisfactory procedures are not corrected promptly, the Engineer may suspend the performance of any or all other construction activities until the unsatisfactory condition has been corrected, and such suspension must not be the basis of any claim by the Contractor, for additional compensation from Metro-North nor for an extension of time to complete the work.

1.5 STANDARDS AND REGULATIONS

A. The Contractor must comply with the requirements of the permits and all applicable Federal, State, County and Local statutes and ordinances relating to the prevention and abatement of soil erosion, sediment and dust.

B. In the event of conflict between requirements of these Specifications and the pollution control laws, rules and regulations of Federal, State, County, Local or other governing Authorities, the more restrictive laws, rules and regulations must govern.

C. New York State Guide for Urban Erosion and Sediment Control.

D. The Contractor is responsible to follow Federal Regulation 40 CFR Part 122 and State Pollutant Discharge Elimination System (SPDES). It is Contractor's responsibility to submit for the Permit Notice of Intent (NOI), and any associated permit that are be required.

PART 2 - PRODUCTS

2.1 CRITERIA

A. Conform to NYSDOT Standard Specifications, Section 209-2, Materials.

2.2 MATERIALS

A. Bales: Bales shall be tightly bound and meet the requirements of either hay or straw below:

B. Hay: Hay for mulching shall be mowings of acceptable herbaceous growth that is free of noxious weeds. Materials that are low grade and unfit for farm use such as "U.S. sample grade" will be acceptable. Weight shall be calculated on the basis of the material having not more than 15% moisture content.

1. Basis of Acceptance: Acceptance shall be based on inspection by the Engineer for compliance with the material requirements.

C. Straw: Straw for mulching shall be stalks of oats, wheat, rye, or other approved crops, which are free from noxious weeds. Materials that are low grade and unfit for farm use, such as "U.S. sample grade" will be acceptable. Weight shall be calculated on the basis of the material having not more than 15% moisture content.

D. Inlet Filters: Inlet Filters shall meet the requirements of New York Guidelines for Urban Erosion and Sediment Control.

E. Stabilized Construction Entrance – Stabilized construction entrance shall be installed as detailed on the plans and located at the entrance to paved roadways or as directed by the Engineer. Stone shall conform to ASTM C-33, size No. 2 (2-1/2" to 1-1/2") or No. 3 (2" to 1"). Use clean crushed angular stone.

F. Silt Fence – Silt fence shall meet the requirements of New York Guidelines for Urban Erosion and Sediment Control. The silt fence shall be Mirafi 100X or approved equal and conform to AASHTO M 288-96 specification for unsupported silt fence. Approved equals shall be selected from the NYSDOT Materials Bureau Approved List for geotextile.

PART 3 - EXECUTION

3.1 PREPARATION

A. Furnish products as indicated.

B. Ensure substrates are in suitable condition to receive the work described in this Section.

3.2 INSTALLATION

A. Initiate erosion controls during construction to prevent siltation of any affected channels, streams or storm sewer systems.

B. Installation of the temporary soil erosion and water pollution controls shall be installed in accordance with Section 209-3, Construction Details of NYSDOT Standard Specifications.

C. Inspect temporary soil erosion control measures on a regular basis and after heavy rainstorms. Remove temporary soil erosion control measures after their useful life has passed or the soil has stabilized.

D. Silt Fence – At least 3' wide and allow for 2' height after 1' has been buried in the existing soil. Fence posts may be steel or 2" x 2" nominal timber.

E. Remove all soil erosion and sediment control devices at the completion of the work or as ordered by the Engineer.

3.3 STOCKPILE AREAS

A. Excavation spoils stockpiled for reuse or for disposal shall be stored on-site at approved locations as shown in the Contract Documents. If additional space is required it shall be supplied at the Contractor's expense.

B. The storage/stockpile area shall have a protective barrier to prevent material and persons from entering the tracks and which does not foul the tracks.

C. Stockpiles shall be secured with adequate erosion control measures as not to lose stockpiled material while awaiting transport.

END OF SECTION

SECTION 31 40 00 - SHORING AND UNDERPINNING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Detection of movement

B. Shoring and underpinning

C. Concrete piers and walls

D. Fill and backfill

E. Temporary supports

F. Restoration

1.2 REFERENCED SECTIONS:

A. Section 01 33 00 – Submittal Procedures

B. Section 31 00 00 – Earth Moving

C. Section 31 50 00 – Excavation Support and Protection

1.3 REFERENCES

A. Municipality’s Supplemental Building Code

1.4 DEFINITIONS

A. Shoring: Props or posts of timber or other material in compression or bending, used for temporary support of excavations, formwork, or unsafe structures.

B. Sheeting: A line of timber or planks, plain or tongue-and-grooved on sides, driven endwise into the ground to protect subgrade operations.

C. Underpinning: Permanent construction, as indicated, which directly transmits existing structure foundation loads to a lower bearing elevation or strata, and which preserves the structures being underpinned.

D. Support: Facilities required to prevent movement of existing structures until the completion of the underpinning.

E. Lagging: A temporary or permanent excavation support structure consisting of heavy timber boards, planking, or sheathing secured in place by steel H-piles.

F. Restoration: Reconstruction by repair or replacement of portions of structures removed or altered by underpinning and support operations.

G. Parcel: An area as indicated, including the structures thereon, and any vaults and permanent closure walls connected thereto.

1.5 SUBMITTALS

A. Requirements: Refer to Section 01 33 00 – Submittal Procedures for submittal requirements and procedures. Shop Drawings and supporting calculations for shoring and underpinning shall be submitted to the Engineer for review and approval.

B. Excavating, Shoring, and Underpinning Program: Prepare and submit a written schedule and procedure, along with detailed drawings, of the proposed excavations, shoring, and underpinning work to the Engineer for review.

C. Shop Drawings: Submit Shop Drawings, indicating method, staging, and necessary details for construction of underpinning and support for each structure on which work is to be performed. Show details of shop assemblies when required for restoration of structures. Shop Drawings and calculations shall be prepared, sealed, and signed by a professional engineer currently registered in the State of New York.

D. Calculations: Submit design analyses and calculations to support Shop Drawings.

E. Procedures:
1. Submit procedure for detection of movement, as specified in Article 3.01 herein.
2. Submit procedure for preloading (jacking load) new foundations.
3. Submit procedure for proof load testing and preloading (jacking load) of lateral support systems, such as strut and tieback assemblies.

F. Jacking Gage Calibration: Submit data for the pressure gage and jack combinations certified by an accepted testing laboratory not earlier than 14 days prior to start of use for underpinning.

G. Restoration: Submit procedures, methods, and materials lists for restoration of structures and facilities.

1.6 SITE CONDITIONS

A. Access: In cases where parcels are not available upon Notice to Proceed, parcels will be available as indicated in the Contract Specifications. Notify the Railroad and the local municipality at least 30 days in advance of the date on which the Contractor requires occupancy of parcels to be underpinned, supported, and restored.

B. Staging and Working Space: Working areas for underpinning and support are shown on the Contract Drawings. If additional working areas beyond those obtained by the railroad are necessary, obtain use of such areas at no additional expense to the railroad.

C. Permits: The Contractor will obtain and pay for permits for entry into structures and for the right to perform underpinning, support, and restoration as indicated. The
   1. Contractor shall obtain and pay for all other permits, give all notices required, and make all other arrangements necessary.

D. Temporary Partitions: Where indicated or required, build closed temporary partitions of suitable materials to isolate the work site from the portions of the structure not occupied by the Contractor.

E. Maintenance of Services: Locate, protect, support, and maintain uninterrupted all utilities, equipment, services, and owner's and tenant's chattels within the limits of the underpinning work, or relocate same as indicated or required.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Requirements: The Contractor shall furnish all materials, tools, equipment, facilities, and services as required for providing the necessary shoring and underpinning work and facilities. Jacks and jacking equipment shall be more than adequate for the imposed loads and shall be provided with calibrated gages.

B. Shoring and Bracing Materials: Provide heavy timber posts, beams, planks, boards, pipe struts, pin piles, and accessories as required.

C. Lagging and Sheeting Material: Provide heavy timber boards, planking, or sheathing as required. Lagging boards shall be secured in place by steel H-piles, with boards inserted between the H-flanges.

D. Concrete: Refer to Sections 03 10 00 Concrete Forming and Accessories, 03 20 00 Concrete Reinforcing, and 03 30 00 Cast-In-Place Concrete for requirements. Concrete shall be regular concrete weighing not less than 145 pounds per cubic foot, with a minimum compressive strength at 28 days of 4,000 psi.

E. Grout: Refer to Section 03 60 00 Grouting for requirements.

F. Structural Steel: Refer to Sections 05 12 00 Structural Steel Framing and 05 50 00- Metal Fabrications for requirements.

PART 3 - EXECUTION

3.1 DETECTION OF MOVEMENT

A. For each existing structure that may be affected by the work, install settlement markers on each footing, building corners, wall or surrounding improvements to be monitored. Settlement markers shall be capable of being read to an accuracy of 0.005 foot.

B. Take and record readings not less than once per week during performance of the work until the permanent structures is complete to the ground level.

C. Stop work; notify the Engineer, and take immediate remedial action if movement of the existing structure occurs during performance of the work.

D. Upon completion of the work, take weekly readings of the measurement points for a period of 4 weeks or longer if movement persists, and report the results to the Engineer.

E. The detection of movement shall be performed by a qualified licensed land surveyor or civil engineer.

3.2 SHORING AND UNDERPINNING

A. Existing footings, foundations, grade beams, retaining walls, track, or pavement which may be affected by excavation operations shall be shored or underpinned adequately or otherwise protected against settlement and shall be protected against lateral movement.

B. Provide soldier piling, lagging and sheeting, tie-backs, slurry diaphragm wall, and cementitious grouting, as required, to hold back earth at excavations and as required to prevent cave-ins and earth sloughs.

C. Footings, foundations, grade beams, retaining walls, or pavements which have been undermined by earthwork and pile-driving operations shall be filled and supported with concrete extended to undisturbed bearing earth or bedrock.

D. Concrete may be placed as a stiff mix of minimum slump (dry pack), or concrete may be pneumatically placed (shotcrete), or concrete may be placed by conventional methods with concrete formed to hold it in proper position.

3.3 CONCRETE PIERS AND WALLS

A. Install concrete underpinning piers and walls as indicated, with the bottom at the indicated or bearing elevation and the top approximately three inches below the structure to be underpinned. Dry pack the space within three days after concrete placement is completed.

B. Where earth forms are indicated, install waterproof building paper or board between the earth and concrete to prevent water loss from the fresh concrete.

C. Do not remove support of existing structure until concrete piers or walls have attained design strength.

3.4 FILL AND BACKFILL

A. Provide engineered fill and backfill in accordance with applicable requirements of Section 31 00 00 Earth Moving, after acceptance of the underpinning by the Engineer.

3.5 TEMPORARY SUPPORTS

A. Install temporary supports where necessary to support structures to be underpinned and those that will be affected by underpinning and restoration work.

3.6 RESTORATION

A. Restore existing structures to conditions equivalent to those existing prior to the start of shoring and underpinning work, including repair of any settlement-related damage.

END OF SECTION

SECTION 31 50 00 – EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Work of this Section includes the installation and removal of temporary excavation support necessary for excavations which would otherwise encroach on the track envelope, or which are influenced by existing footings under load.

1.2 REFERENCES

A. Perform all work in accordance with the latest editions and revisions of applicable standards or specifications of:

B. American Railway Engineering and Maintenance-of-Way Association (AREMA)

C. American Society for Testing and Materials (ASTM)
   1. A328 Standard Specification for Steel Sheet Piling

D. American Institute of Steel Construction (AISC), Steel Construction Manual

E. NYSDOT Standard Specifications Construction (Latest Revision) Section 552 - Support and Protection Systems

1.3 SUBMITTAL

A. Within thirty (30) calendar days after Notice of Award, submit to the Engineer for approval:
   1. Complete description of equipment and methods.
   2. Shop Drawings prepared and stamped by a NY State Registered Professional Engineer. Drawings shall include:
      a. Excavation support layout
      b. Excavation support size and grade
      c. Excavation support tip and cutoff elevations
   3. Construction Procedure
   4. Design calculations prepared and stamped by NY State Registered Professional Engineer.
   5. Mill Certificates with material deliveries.
   6. Daily Driving Records.
   7. Drawing with as-driven locations upon completion of driving.
   8. Vibration Monitoring Plan to document vibrations during pile driving operations to ensure maximum limits are not exceeded.

1.4 QUALITY ASSURANCE

A. Contractor shall have prior experience in the successful completion of similar construction. See also Section 01 43 00 Quality Assurance.

1.5 MATERIAL HANDLING, DELIVERY & STORAGE

A. Handle ship and store material in a manner that will prevent distortion or other damage.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Excavation support materials shall be in good condition.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. The review of the shop drawings by the Engineer shall not be construed as relieving the Contractor of his responsibility for the safety and adequacy of the installation.

B. The Contractor shall be solely responsible for the selection, design, manufacture, handling, transporting, installation, maintenance, and removal of the temporary excavation support system.

3.2 SUBSURFACE DATA

A. Subsurface data used for design shall be documented and submitted to the Engineer. The Contractor is responsible for determining and evaluating the excavation support installation requirements.

3.3 DESIGN

A. Excavation support adjacent to railroad tracks shall be designed for a surcharge produced by a live load of Cooper E-80, in addition to lateral earth pressure.

3.4 SHEETPILE DRIVING

A. The Contractor shall use a hammer that he determines is the lightest possible needed to install the system without damage.

B. No driving operations will be permitted within 50 feet of any concreting operation or within 50 feet of any concrete less than 48 hours old.

C. Excavation support elements driven to the required depth and extending above the required top elevation shall be trimmed off at the proper elevation where clearance is deemed necessary by the Engineer.

3.5 TOLERANCES

A. Excavation support shall be accurately positioned at the location shown on the Shop Drawings.

B. No component shall be out of plumb by more than one percent (1%).

C. Horizontal alignment deviation shall not exceed three inches (3”).

3.6 OBSTRUCTIONS

A. In the event an obstruction is encountered, adjacent components shall not be driven below the elevation of the obstruction until the obstruction has been identified and confirmation of operations is deemed safe by the Engineer.

B. The Contractor shall have on hand suitable equipment for spudding through buried timber, riprap

and similar obstructions and shall employ this equipment in a manner satisfactory to the Engineer.

3.7 NON-CONFORMING/DAMAGED PILES

A. Piles shall be driven by approved methods in such a manner as to avoid damage and to ensure acceptable alignment.

B. If piling is damaged during installation, driven out of the specified tolerances, or rejected by the Engineer, it shall be removed and replaced at the Contractor's expense.

C. Rejected or damaged piles shall be pulled and shall become the property of the Contractor and removed off-site.

3.8 REMOVAL

A. Piles shall be removed after completion of foundation construction. Removed piles shall become the property of the Contractor and removed off-site.

B. If the removal of excavation support from excavation areas causes significant settlements in the opinion of the Engineer, all excavation support shall be cut off at six inches below finished grade and left in place.

C. Where excavation support is required adjoining the railroad track, it shall be cut off 1'-0" below the bottom elevation of the railroad tie and left in place, unless otherwise directed by the Engineer.

END OF SECTION

SECTION 32 01 16 - MILLING ASPHALT CONCRETE

PART 1 - GENERAL

1.1 The Contractor shall be required to mill (grind) and remove a portion of the existing asphaltic wearing course to contour the roadway to the required grade, depth, elevations and limits specified on the Contract Drawings. The work shall include, but not be limited to, sampling, testing and disposal of material samples tested for asbestos, sawcutting joints, grinding and cutout of existing asphaltic material at street hardware and at sawcut joints, removing pavement markers where applicable, loading said material into dump trucks, disposing of milling materials (grounds) and any incidentals required to complete the work all in accordance with the contract drawings, the specifications, to the satisfaction of the Engineer.

PART 2 - MATERIALS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. Milling of existing asphaltic concrete wearing course, under this Section, shall be used as indicated in the plans or as ordered by the Engineer.

B. The Contractor shall fully grind these areas down to the required depth, to contour the roadway pavement as directed by the Engineer. All milling operations shall be done using an acceptable milling method, taking care not to damage the pavement to remain and in a manner that prevents dust and other particulate matter from escaping into the air.

C. The Contractor shall mill to a depth of 2 inches unless otherwise shown on the plans or directed by the Engineer. Where the Contractor exceeds the intended milling limits, without prior approval from the Engineer, they shall restore the roadway with Binder Mixture to the intended elevation, at no cost to the City. In addition, no payment will be made for any additional millings made beyond the intended milling limits specified above.

3.2 EQUIPMENT

A. All milling equipment shall be as approved by the Engineer. Any teeth in the milling drum that become dislodged, broken or unevenly worn shall be replaced immediately with teeth of the same length as the remaining teeth in that row.

3.3 ASBESTOS TESTING

A. Prior to performing any milling operations at any site location, the Contractor shall be required to take four (4) 4” diameter pavement core sample of the existing asphaltic concrete wearing course to be tested for the presence or absence of asbestos by the Contractor’s independent testing laboratory. The exact location of each pavement core sample shall be as directed by the Engineer. This work shall be performed and the test results known to both the Contractor and the Engineer at least two (2) weeks prior to performing milling operations under this Section.

B. The Contractor's independent testing laboratory shall be an approved N.Y.S. licensed testing laboratory certified to test for the presence of asbestos in an asphaltic concrete material mix. The testing laboratory shall be required to take immediate chain-of-custody of the core samples as they are taken in the field, transport the samples to their laboratory for testing, and dispose of them at the end of the work. Under no circumstance shall core samples be taken without the direct supervision of the testing laboratory. The testing laboratory shall then notify both the Contractor and the Engineer of the results.

C. Should the presence of asbestos be found to exist within the asphalt pavement designated to be removed, the Contractor shall immediately stop all milling operations until otherwise directed by the Engineer and the limits of asbestos contamination has been determined by subsequent sampling. See Section 02 82 13 for Asbestos Abatement Procedures.

3.4 PREPARATION

A. Where new proposed asphaltic concrete pavement is to meet existing asphalt pavement, the Contractor shall saw-cut a joint line in the existing asphaltic wearing course, for a depth of 2 inches. The joint line shall cross the full width of roadway pavement or where directed by the Engineer for localized areas. Asphaltic concrete material adjacent to these sawcut lines shall be removed to a depth of 2 inches to form a squared out joint for the proposed of keying the new asphalt pavement to the existing asphalt pavement. Rounded transition areas will not be acceptable.

B. Where the asphaltic concrete material meets street hardware, the asphaltic concrete material shall be removed for a depth of 2 inches by milling and cutting out the asphaltic material to expose existing frames of street hardware. Any remaining material, within that 2 inch depth, around and adhering to street hardware shall be completely removed by hand and/or hand held cleaning equipment. Rounded transition areas will not be acceptable.

3.5 MILLING

A. The Contractor shall mill the specified areas down to the required depth and grades in the existing asphaltic concrete wearing course and/or granular base using an acceptable milling and dust control methods and equipment. Care shall be taken to minimize dust pollution and damage to the pavement to remain. For dust control methods and equipment, the Contractor shall employ dust collection and/or watering devices, as approved by the Engineer, without which no milling will be allowed.

B. Millings shall be removed and the remaining surface immediately swept, mechanically so that the surface of the remaining pavement is free of loose asphaltic concrete, to the satisfaction of the Engineer. The millings shall be loaded directly into dump trucks and shall be satisfactorily disposed of away from the site as excavated material by the Contractor. Each truck load shall be hand leveled by raking prior to measurement and covering for removal.

C. Provisions shall be made for removal of any water that may be trapped due to the milling operation and surface of milled areas shall be swept clean prior to being opened to traffic and prior to the subsequent resurfacing operation.

PART 4 - The Contractor shall apply temporary pavement paint to delineate existing pavement markings and/or parking stalls as ordered by the Engineer.

END OF SECTION

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SECTION 32 01 90.26 – WATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The applicable provisions of Division 1 shall apply to this Section.

1.2 DESCRIPTION

A. This work shall consist of watering plant material in accordance with the plans, specifications and direction of the ISA Certified Arborist and the Landscape Architect.

1.3 SUBMITTAL

A. Workers Qualifications: Names and addresses of 5 similar projects that each person has worked on during the past 2 years.

B. Watering Schedule: Watering schedule including anticipated dates and locations of watering for each type of planting. Frequency will vary depending on environmental factors. The total amount of water from natural or applied irrigation shall not be less than one inch per week. Watering schedule and methods to be used shall be approved by the ISA Certified Arborist and the Landscape Architect.

C. Catalog Cut: Watering Bag - Contractor shall submit one sample of watering bag product along with all product information and manufacturer's installation instructions.

1.4 RELATED WORK

A. Related work is described in the following sections of the specifications:

1. Section 32 91 13.16: Mulching

1.5 REGULATORY REQUIREMENTS

A. Not Used

PART 2 - PRODUCTS

2.1 MATERIAL

A. Water: potable water suitable for human consumption, free of all chemicals.

B. Water: Furnish all hoses, nozzles, piping, connections and water required to adequately water plants and turf.

C. Watering Bag: Deciduous trees: 30" tall x 18" wide, 20-gallon polyethylene watering bag with nylon webbing, black polypro straps and green nylon zippers (UV stabilized to withstand exposure to light). Thick with a polyester scrim lining, such as TreeGator, as manufactured by

Spectrum Products Inc., Youngsville, NC 27596, (866) 873-3428, or approved equal by ISA Certified Arborist and Landscape Architect.

PART 3 - EXECUTION

3.1 PREPARATION

A. The soil around each tree shall be thoroughly saturated with at least twenty (20) gallons of water. After the initial saturation, the tree irrigation bags shall be filled and refilled every-other day for first week of establishment. For the first six months during establishment of trees (after the first week), and during the months of May through September, fill the watering bag once a week. During weeks where temperatures average 90 degrees or above, fill watering bag three times a week or more at the discretion of the Landscape Architect. For the remainder of the period of establishment, water no less than twice a month or more at the discretion of the Landscape Architect. During periods of drought consult Landscape Architect for additional watering schedule.

B. All planting areas shall be cultivated and weeded with hoes or other approved tools within the period from May 1st to October 1st, and such cultivating and weeding shall be repeated at least once a week. Under no conditions shall weeds be allowed to attain more than six inches (6") of growth.

C. Watering of trees shall begin immediately at time of planting, and shall continue until completion of the warranty period. Watering shall consist of keeping the plants in a healthy growing condition.

D. Water shall be supplied to all trees and plants as directed by the ISA Certified Arborist or the Landscape Architect according to the schedule outlined below. Water shall not be supplied when the soil within the root zone of the new plants or germinating seeds is saturated from recent heavy rains or snow melt. If necessary due to drought as determined by the ISA Certified Arborist or Landscape Architect, water shall be applied more frequently than scheduled or during nonscheduled periods. Water shall not be applied in a manner which damages plants, trees, shrubs, seed beds, plant saucers, mulch, tree protection barriers, or adjacent areas. Damage resulting from watering operations shall be repaired at the Contractor's expense. For all plant material the soil around plant material shall be thoroughly saturated at time of planting.

3.2 METHOD

A. Water Truck:

1. Deciduous Trees: At time of planting, thoroughly saturate soil around tree. After saturation affix two (2 each) 20-gallon slow release watering bags, as approved by Landscape Architect, to trunk of tree. Fill watering bags every-other day for first week of establishment. For the first six months during establishment of trees (after the first week), and during the months of May through September, fill the watering bag once a week. During weeks where temperatures average 90 degrees or above, fill watering bag three times a week or more at the discretion of the Landscape Architect. For the remainder of the period of establishment, water no less than twice a month or more at the discretion of the Landscape Architect. During periods of drought consult Landscape

Architect for additional watering schedule.

B. Shrubs, groundcover and perennials: At time of planting, the soil around plant material shall be thoroughly saturated. Watering shall not cause uprooting or exposure of plant roots to the air. Water daily for the first week, thoroughly soaking ground. For the first six months during establishment of plants (after the first week), and during the months of May through September, plants shall receive 3-inch deep waterings (2 gallons/square foot of planting area per watering) throughout the planting area once per week from May 1 through October 31. During every week where temperatures average 90 degrees or above, water three times a week or more at the discretion of the Landscape Architect. For the remainder of the period of establishment, water no less than twice a month or more at the discretion of the Landscape Architect. During periods of drought consult Landscape Architect for additional watering schedule.

C. Seeding: The soil surface of seeded wildflower areas shall be kept constantly and evenly moist during a six week (minimum) germination period following seeding. Each watering during these germination periods shall be 3 inches deep and shall be evenly distributed over the entire seeded area. Following the germination period(s), seeded areas shall receive a 1-foot-deep (minimum) watering evenly distributed over the entire seeded area at each watering. Frequency of these waterings shall be as necessary to keep the soil 1 foot below the surface evenly moist for a full growing season following germination. A light sprinkling or light spray technique which does not erode the soil or wash away the seed shall be used.

D. Watering schedule and methods to be used shall be approved by the Landscape Architect.

END OF SECTION

SECTION 32 11 00 - BASE COURSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and Division 01 Specification Sections, apply to the Work of this Section.

B. Related Sections include the following:
   1. Section 31 11 00 Clearing and Grubbing
   2. Section 31 20 00 Earth Moving
   3. Section 32 12 00 Flexible Paving

1.2 SUMMARY

A. This Section specifies requirements for furnishing, placing, and compacting:
   1. Subbase courses.
   2. Base Courses.

1.3 REFERENCES

A. Abbreviations and Acronyms:
   1. BUD: NYSDEC beneficial use determination.
   2. NYSDEC: New York State Department of Environmental Conservation.
   3. NYSDOT: New York State Department of Transportation.
   4. RAP: Reclaimed asphalt pavement.
   5. RCA: Recycled concrete aggregate.

B. Definitions:
   1. Elongated Particle: A flat or elongated particle is one that has its greatest dimension more than 3 times its least dimension.

C. Reference Standards:
   1. American Association of State Highway Transportation Officials (AASHTO):
      a. AASHTO T 89 - Standard Method of Test for Determining the Liquid Limit of Soils.
      b. AASHTO T 90 - Standard Method of Test for Determining the Plastic Limit and Plasticity Index of Soils.
      c. AASHTO T 99 – Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-1b) Rammer and a 305-mm (12-in.) Drop.
      d. AASHTO T 146 - Standard Method of Test for Wet Preparation of Disturbed Soil Samples for Test.
      e. AASHTO T 191 - Standard Method of Test for Density of Soil In-Place by the Sand-Cone Method.

f. AASHTO T 224 - Standard Method of Test for Correction for Coarse Particles in the Soil Compaction Test.

2. ASTM International (ASTM):
   a. ASTM C88 - Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
   b. ASTM C117 - Standard Test Method for Materials Finer than 75-µm (No.200) sieve in Mineral Aggregates by Washing.
   c. ASTM C131 - Standard Test Method for Resistance to Degradation of Small- Size coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
   d. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   e. ASTM D75 – Standard Practice for Sampling Aggregates.
   f. ASTM D448 – Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
   g. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN- m/m3)).
   h. ASTM D2922 - Standard Test Methods for Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth).
   i. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
   j. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
3. State of New York:
   a. Official Compilation of the Rules and Regulations of the State of New York (NYCRR).
      1) 6NYCRR Part 360 - Solid Waste Management Facilities.
      2) 16 NYCRR Part 753 - Protection of Underground Facilities.
   b. New York State Department of Transportation (NYSDOT):
      1) NYSDOT Standard Specifications (U.S. Customary Units). https://www.dot.ny.gov/main/business-center/engineering/specifications.
      2) New York State Standard Sheets (U.S. Customary Units). https://www.dot.ny.gov/main/business-center/engineering/cadd-info/drawings/standard-sheets-us.
4. United States Government:
   a. Occupational Safety and Health Administration (OSHA):
      1) 29 CFR 1910 Occupational Health and Safety Standards.
      2) 29 CFR 1926 Safety and Health Regulations for Construction.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Notify utilities prior to all excavations.
   2. Do not interfere with persons, firms, corporations, or utilities, removing, changing, replacing, or employing protective measures at their property or structures.
      a. Allow these persons, firms, corporations, or utilities to take such measures as they may consider necessary or advisable under the circumstances.
      b. Cooperate fully with the owners of underground and overhead utilities when utility removal or rearrangement operations are in progress to ensure reasonable progress, minimize duplication of operations, and eliminate unnecessary interruption of services.

c. Measures employed or not employed by these entities do not relieve the Contractor of his responsibilities.

1.5 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Special Inspections:
      a. Under the Building Code of New York State, special inspections by the code-required Approved Agency may be necessary to obtain approval of the Work of this Section.
      b. Code-Required Approved Agency for Performing Special Inspections:
         1) To perform the special inspections required by the Building Code of New York State, the Engineer acting as Metro-North's agent will employ an independent Approved Agency.
   2. Testing and Inspection Agency:
      a. To perform testing and inspections not considered special inspections by the Building Code of New York State, employ an independent Testing Laboratory.

B. Qualifications:
   1. Testing Laboratory's Qualifications:
      a. To perform testing and inspections required by this Section, employ a Testing Laboratory having the qualifications specified in Section 01 43 00, Quality Assurance.
      b. Submit the Testing Laboratory's qualifications to the Engineer for approval.

C. Certifications:
   1. Subbase Certificate of Compliance:
      a. Submit certification from the source of subbase materials indicating that the subbase material meets NYSDOT requirements for Type 1 or Type 2 subbase.

1.6 SUBMITTALS

A. Action Submittals:
   1. Submit the following to the Engineer for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
      a. Product Data:
         1) Subbase course material.
         2) Subbase gradation.
      b. Certificates:
         1) Subbase Certificate of Compliance.
      c. Qualification Statements:
         1) Testing Laboratory's qualifications.

B. Informational Submittals:
   1. Submit the following to the Engineer for information in accordance with the requirements of Section 01 33 00, Submittal Procedures:
      a. Source Quality Control Submittals:
         1) Source of subbase material.
         2) Samples of for each material for preliminary testing or certificates.

b. Site Quality Control Submittals:
   1) Plasticity Index Test Results.
   2) Magnesium Sulfate Soundness Test Results.
   3) Relative Compaction Test Results.
   4) Gradation Test Results.
   5) Moisture Density Test Results.
   6) Compaction Test for Crushed Aggregate Results.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:
   1. Transport aggregate base in suitable vehicles with covers to prevent stray particles from falling off the vehicles onto the streets.

B. Storage and Handling Requirements:
   1. Stockpiling:
      a. Stockpile subbase material except as specified herein.
         1) Stockpile gravel.
      b. Stockpiling reclaimed bituminous material for Type 1 Subbase Alternate C is not required.

1.8 SITE CONDITIONS

A. Ambient Conditions:
   1. Do not perform excavating, backfilling, or compacting operations when either weather conditions or the condition of the materials are such, in the opinion of the Engineer, that the work cannot be performed satisfactorily.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Suitable Material:
   1. Provide suitable material conforming to the material requirements of Section 203 of the NYSDOT Standard Specifications and to the requirements specified herein.
      a. If glass is furnished, furnish glass conforming to the requirements of Section 203.
      b. If recycled concrete aggregate (RCA) is furnished, submit documentation showing that the material obtained is from a New York State Department of Environmental Conservation (NYSDEC) registered or permitted construction and demolition (C&D) debris processing facility as specified in section 360-16.1 of 6NYCRR Part 360.
      c. If blast furnace slag is furnished, submit documentation showing that the material has undergone a NYSDEC beneficial use determination (BUD) prior to its use as specified in section 360-1.15 of 6NYCRR Part 360.

B. Subbase:

1. Provide subbase courses consisting of either NYSDOT Type 1 or NYSDOT Type 2 subbase as specified in section 304 of the NYSDOT Standard Specifications and herein.
2. NYSDOT Type 1 Subbase:
    a. Furnish materials consisting of approved blast furnace slag, stone, sand, and gravel, or blends of these materials with not more than 30 percent by weight of glass; or one of the following alternates:
        1) Type 1 Subbase Alternate A:
            a) Furnish subbase consisting of at least 95 percent, by weight, of recycled concrete aggregate (RCA), and free from organic and other deleterious material.
            b) This Type 1 Subbase material may contain up to 5 percent, by weight, of asphalt and/or brick.
        2) Type 1 Subbase Alternate B:
            a) Furnish subbase consisting of a mixture of recycled concrete aggregate (RCA) complying with the requirements specified for Type 1 Subbase Alternate A mixed with stone, sand, gravel, or blast furnace slag.
            b) This Type 1 Subbase material may contain up to 5 percent, by weight, of asphalt and/or brick.
        3) Type 1 Subbase Alternate C:
            a) Furnish subbase consisting of at least 95 percent, by weight, of bituminous material reclaimed from bituminous pavement and/or shoulders (RAP), well-graded from coarse to fine so at the time of placement it has a maximum top size of 50 mm, and free from organic or other deleterious material, including tar.
            b) The gradation requirements specified in this Section do not apply when the material consists of RAP.
            c) No soundness or Plasticity Index testing is required for this Type 1 Subbase Alternate C.
3. NYSDOT Type 2 Subbase:
    a. Furnish NYSDOT Type 2 Subbase materials consisting of approved blast furnace slag or of stone that is the product of crushing or blasting ledge rock, or a blend of blast furnace slag and of stone.
    b. If, in the opinion of the Engineer, the NYSDOT Type 2 Subbase material becomes unstable during construction, it may be necessary to add a mixture of natural suitable material to the RAP at no increase in the Contract Price.
        1) Acceptance of the final product will be based on an evaluation by the Engineer.
4. Gradation (Job Mix):
    a. Provide material consisting of particles where not more than 30 percent, by weight, of the particles retained on a 1/2-inch sieve is flat or elongated.
        1) Acceptance for this requirement will normally be based on a visual inspection by the Engineer.
        2) If the Engineer elects to test the subbase, greater than 30 percent flat or elongated material will be rejected.
    b. Provide continuously and well graded subbase material when tested in accordance with ASTM C117 and ASTM C136, and having the gradation indicated in Table 32 11 00-1.

Table 32 11 00-1 Subbase Gradation

Sieve Size Designation (Square Openings)	Design Range Percentage by Weight Passing Sieve	
	NYSDOT Type 1	NYSDOT Type 2
4-inch	-	-
3-inch	100	-
2-inch	90 – 100	100
1/4-inch	30 – 65	25 - 60
40	5 – 40	5 - 40
200	0 – 10	0 - 10

5. Plasticity Index:
   a. Furnish subbase so its material passing the 40-mesh sieve has a Plasticity Index of 5.0 or less when tested in accordance with the requirements of AASHTO T 146 Method A (Wet Preparation), AASHTO T 89, and AASHTO T 90.
6. Soundness:
   a. Unless material meeting the requirements of Type 1 Subbase Alternate C is used, furnish subbase having 20 percent or less magnesium sulfate soundness loss after 4 cycles in the Los Angeles abrasion machine as determined in accordance with Grading B as specified in ASTM C131.
7. Submit the gradation and Product Data for material furnished in the subbase to the Engineer for approval.
   a. If glass, blast furnace slag, and/or recycled asphalt product (RAP) is provided, submit Product Data documentation to the Engineer for approval.

C. Base Course:
   1. Aggregate:
      a. Provide crushed aggregate complying with the requirements specified herein unless the use of a different type of material is specifically authorized on the Contract Drawings.
      b. Crushed Aggregate:
         1) Provide clean, hard, sound, and durable crushed stone, rock, or gravel or a combination thereof; and which has the following additional properties:
         2) Provide crushed aggregate uniform in quality, and free of soft, friable, thin elongated, or laminated pieces; disintegrated material; organic material; oil, alkali, and other deleterious substances.
            a) Gradation (Job Mix):
               (1) Provide continuously and well graded crushed aggregate when tested in accordance with ASTM C117 and ASTM C136, and having the gradation indicated in Table 32 11 00-2.

Table 32 11 00-2 Crushed Aggregate Gradation

Sieve Sizes (Square Openings)	Design Range Percentage by Weight Passing Sieve		
	Type A	Type B	Type C
3 inches	100	-	-
2 inches	-	-	-
1-1/2 inches	-	100	-
1-1/4 inches	-	-	100
1 inch	-	-	-
3/4 inch	-	-	-
Number 4	30-75	30-70	38-65
Number 8	20-60	20-60	25-60
Number 30	10-40	10-40	10-40
Number 200	0-12	0-12	3-12

(2) Special Gradation Requirements:

b) When crushed rock is required, provide material with at least one rough, angular surface produced by crushing; and a gradation complying with the requirements of ASTM D448.

c) For sizes 3/4 inch or larger maximum sizes, the portion of the material retained on a No. 4 sieve must be 50 percent by weight.

d) For sizes less than 3/4 inch, the portion of the material retained on a No. 8 sieve must be 50 percent by weight.

(3) When gravel is required, provide material having particles that are fully or partially rounded and water-worn.

e) Crushed rock obtained by crushing rock which exceeds the maximum gradation sizes specified in ASTM D 448 may be combined with gravel provided it is uniformly distributed throughout and blended with the gravel.

f) Plasticity Index:

(4) Unless otherwise indicated, provide material having a plasticity index not more than 5 when tested in accordance with the requirements of AASHTO T 146 Method A (Wet Preparation), AASHTO T 89, and AASHTO T 90.

g) Soundness:

(5) Provide crushed aggregate having a percentage of wear not exceeding 40 after 500 revolutions in the Los Angeles abrasion machine as determined in accordance with Grading B as specified in ASTM C131.

2.2 SOURCE QUALITY CONTROL

A. Tests and Inspections:
   1. Except when materials will be provided from a previously approved source, notify the Engineer of the source of aggregate in writing at least 10 Days in advance of delivering the material to allow sufficient time for required material acceptance testing.
      a. Submit the source of subbase material to the Engineer for approval.
   2. Prior to the start of production, at the start of production, and at intervals during production, submit Samples of each material for preliminary testing to the Testing Laboratory for testing and as the basis for approval of specific lots of aggregates.
      a. The Engineer will determine the sampling points and intervals.
   3. In lieu of material testing, the Engineer may accept certified test results from the State that indicate the aggregate complies with the specified requirements.

B. Non-Conforming Work:
   1. Correct deficiencies uncovered by the measurements or Samples.

C. Coordination of Other Tests and Inspections:
   1. Notify the code-required Approved Agency responsible for performing special inspections when aggregate base for this Contract is being placed and/or tested.
   2. Cooperate with the code-required Approved Agency when they are performing required material verifications and other special inspections.
      a. Provide full access to the Work.

PART 3 - PRODUCTS

3.1 EXAMINATION

A. Verification of Conditions:
   1. Inspect the Site to verify existing conditions and take field measurements to ensure the proper fit of the finished Work.
   2. Underground Utilities:
      a. Comply with applicable requirements of OSHA, the State of New York statutes, especially NYCRR 16 Part 753 regarding Underground Utilities, and the Local General Construction Code.
         1) At least 2 to 10 days prior to the start of digging or excavation Work not counting the day of the call prior to the start of digging or excavation Work, contact Dig Safely New York at 1-800-962-7962 or 811 to arrange for underground utility owners to locate and mark their underground utilities.

B. Pre-Installation Testing:
   1. Ensure that substrates are in suitable condition to receive the work.
   2. If it is evident that the subgrade is pumping at any time prior to placing overlying material onto the subgrade, the Engineer may at no increase in Contract Price require proof rolling with a pneumatic-tire roller or other approved equipment to identify the limits of the unacceptable area.
   3. After completion of excavations other than utility excavations, and prior to scarification and compaction of the subgrade, proof-roll the excavation surface to detect soft or loose zones.

a. Notify the Engineer if any soft or loose zones are encountered during the proof-rolling.

C. Evaluation and Assessment:
1. Notify the Engineer of unexpected subsurface conditions and discontinue working in the affected area until notified to resume work.
2. If unexpected active underground facilities are encountered during the performance of the Work, immediate notify the Engineer.

3.2 PREPARATION

A. Protection of In-Place Conditions:
1. Exercise extreme caution to prevent debris from falling into manholes or other structures.
a. In the event that debris should fall into a structure, remove it immediately.
2. Dust Control:
a. Comply with the requirements specified in the Fugitive Dust Plan specified in Section 01 41 00 for protecting adjacent properties.
b. Provide effective dust control measures on the Site to prevent the spread of dust during earth moving operations.
c. Thoroughly moisten excavation areas by dampening the soil, or employ other similar methods as approved by the Engineer.

B. Surface Preparation:
1. Subgrade:
a. With the exception of areas where new construction is required and compacted fills have been constructed, adjust the moisture content of the subgrade to that required for compaction by adding water, by adding and blending in dry suitable material, or by drying the existing material as required.
1) Maintain the proper subgrade moisture content until the subgrade is compacted and the overlying material is placed.
b. Correct ruts and soft yielding places caused by improper drainage conditions, hauling, or other causes before placing the base course.

C. Demolition / Removal:
1. Strip and properly dispose of unsuitable material in the area of the required subgrade including removing existing pavement and obstructions such as stumps, roots, rocks, and similar items from the subgrade area.
a. Clear and grub unpaved subgrade area in accordance with the requirements of Section 31 10 00, Site Clearing.
b. Demolish existing pavement where indicated on the Contract Drawings, and properly dispose of demolition debris off-site unless otherwise allowed by the Engineer.

3.3 INSTALLATION

A. Subbase:
1. Furnish, place, and compact the subbase course of the proper Type to the lines, grades, thicknesses, and typical sections indicated in the Contract Documents.

a. Provide subbase material the Contractor is capable of placing and fine grading to the required tolerances.

2. Should the subbase course become unstable at any time prior to the placement of the overlying course, correct the unstable condition to the satisfaction of the Engineer at no increase in the Contract Price.
   a. Perform any required modification prior to placing the material on the grade.
3. Relative Compaction:
   a. Remove soft, loose, and disturbed materials; replace them with acceptable materials; and compact the replacement material as directed by the Engineer.
      1) If soft or loose zones are found under proposed slab, pavement, or foundation areas, excavate the soft or loose material to a depth reviewed in advance by the Engineer, then fill with structural fill as specified in Section 31 20 00, Earth Moving, and compact as specified for such fill.
      2) After adjusting the moisture content to that required for compaction, scarify and loosen the subgrade to a depth of at least 6 inches.
      3) Below future slabs, pavements, and foundations, scarify the exposed native and pre-existing fill subgrade soils to a depth of 8 inches.
      4) In areas where fill material is required, a layer of approximately 3 inches of the fill material may be spread and compacted with the subgrade material to provide a better bond.
   b. Compact the material to the relative density specified.
      1) Construct the cut and fill areas to achieve a uniform soil structure having the minimum dry density specified in Table 32 11 00-3 when the compaction is tested in accordance with Method A in AASHTO T 99 and AASHTO T 191, or with ASTM D2922 and ASTM D3017.
   c. Adjust the minimum dry density percent obtained from AASHTO T 99 in accordance with the coarse particle correction procedures specified in AASHTO T 224 for maximum density determination, to compensate for the rock content larger than that which will pass a Number 4 sieve.

Table 32 11 00-3 Minimum Dry Density Required

Location	Minimum Dry Density
Subgrade under pavement	100 percent
Subgrade under curbs, gutters, and sidewalks	90 percent

4. Grading in Areas Not to be Paved:
   a. Where grade only is called for on the Contract Drawings, grade the area to meet the tolerances for the subgrade where subbase or base material is to be placed.
   b. Construct the surface to a straight grade from the finished pavement elevations shown on the Contract Drawings to the elevation of the existing ground at the extremities of the area to be graded.
5. Grading in Areas to be Paved:
      1) Where pavement or structures are called for on the Contract Drawings, grade the area in an orderly sequence, placing base course directly following the grading.

2) Do not allow grading operations to precede base course placement by more than 1200 feet unless otherwise specifically approved by the Engineer.
3) At the end of each day's operations, place the first lift of base course no more than 300 feet behind the finished subgrade area.
   a) Do not allow drop-offs on opposite sides of pavement at the same time.
   b) When excavating for concrete work, such as curb, gutter, or sidewalk, place the excavated material in uniform windrows that do not interfere with property access or traffic flow in streets.

B. Base Course:
1. Prior to placing aggregate base course materials, properly prepare the subgrade as specified herein.
   a. Verify that the subgrade has been properly prepared to receive the aggregate base course.
2. Place base course material in lifts to provide a course to the lines, grades, dimensions, moisture, density, and typical sections as indicated in the Contract Documents.
   a. Aggregate base course measuring 6 inches or less in compacted thickness may be placed in a single layer.
   b. Deliver the aggregate to the roadbed as a uniform mixture, and spread the aggregate in one operation.
   c. Avoid segregation of the material into pockets of fine and coarse material.
3. Aggregate base course measuring more than 6 inches in compacted thickness must be built up from successive layers, each of approximately equal compacted thickness not to exceed 6 inches per layer.
   a. Clean previously constructed layers of loose and foreign material prior to placing the next layer.
4. After distributing the aggregate base course, water the material and, immediately thereafter, blade the material to a uniform layer that will net the required thickness after compaction.
   a. Apply a quantity of water that will assist compaction, taking care to avoid wetting the subgrade or any lower base course during the watering operation to an extent that is detrimental to the Work.
      1) Moisture condition the material within the range of plus or minus 2 percent of optimum moisture, and compact the material to a dry density greater than 95 percent of maximum dry density as determined in accordance with the requirements of ASTM D 1557.
   b. Keep the surfaces of the compacted material in lower layers moist until the material is covered by the next layer.
   c. If the materials deposited are not uniformly blended together, continue the blading operation as necessary to eliminate segregation.
5. Compact the material to assure a compacted relative density of 100 percent as determined using the methods and other criteria defined in this Section.
6. Upon completion of the entire operation, the base surface must be true, even, uniform, and conform to the grade and cross-section specified or shown on the Contract Drawings.
   a. Finish the base course by blading the surface of the aggregate base course using equipment designed especially for this purpose.

C. Special Techniques:
1. Excavation Safety:

a. Sole responsibility for making all excavations in a safe manner is the Design-Builder's.
b. Provide suitable protection against bodily injury.

D. Tolerances:
1. Subgrade Tolerances
a. Subgrade upon which pavement, sidewalk, curb and gutter, driveways, or other structures are to be directly placed may not vary more than 1/4 inch from the specified grade and cross-section.
b. Subgrade upon which subbase or base material is to be placed may not vary more than 3/4 inch from the specified grade and cross- section.
c. Variations within these specified tolerances must be compensating so that the average grade and cross-section specified are met.
2. Base Course Tolerances:
a. Finished Surface Tolerance:
1) The finished surface of the aggregate base course may not vary more than 1/2 inch above or below required grade and cross-section when tested with a 16-foot straightedge applied parallel with and at right angles to the centerline.
2) Do not add thin layers of material to the top layer of base course to meet the specified grade.
3) If the elevation of the top layer is 1/2 inch or more below grade, scarify the top layer of the base to a depth at least 3 inches, add new material, and blend and re-compact the material to bring it to grade.
4) If the finished surface is above the design grade, cut the material back to grade and re-roll the surface.
b. Thickness Tolerance:
1) The completed thickness of the aggregate base course may not vary more than 1/2 inch of the design thickness.
c. Moisture Content Tolerance:
1) During placing operations, the moisture content of the material may not vary by more than 1-1/2 percentage points from the optimum moisture content as determined in accordance with the requirements specified in ASTM D 1557.

3.4 REPAIR/RESTORATION

A. Restore to their original condition those portions of the Site not designated for alteration.

3.5 SITE QUALITY CONTROL

A. Site Tests and Inspections:
1. During the period when aggregate base is being placed, the Testing Laboratory and the code-required Approved Agency must perform routine and other testing of materials.
a. Advise the Testing Laboratory and code-required Approved Agency sufficiently in advance of operations to allow testing personnel to be assigned and to provide sufficient time for quality tests to be performed and completed.
b. The Testing Laboratory and the code-required Approved Agency will perform additional materials testing due to changes in materials or proportions requested by

the Contractor or testing required due to failure of material to meet specified requirements.

c. Failure of the Testing Laboratory or the code-required Approved Agency to detect defective work will not prevent its rejection later when the defect is discovered, neither does it obligate the Engineer or Metro-North to grant final acceptance of the Work.

2. Keep testing results on file at the Site, and submit copies of the test results to the Engineer for information.

B. Site Tests:

1. Plasticity Index Test:
   a. Test Procedure:
      1) Have the Testing Laboratory test the Plasticity Index of the materials performed in accordance with the method specified in ASTM D4318.
   b. Acceptance Criteria:
      1) Materials complying with the requirements specified are acceptable.
2. Magnesium Sulfate Soundness Test:
   a. Test Procedure:
      1) Have the Testing Laboratory test the Magnesium Sulfate Soundness of the subgrade performed in accordance with the method specified in ASTM C88.
   b. Acceptance Criteria:
      1) Materials complying with the requirements specified are acceptable.
3. Relative Compaction Test:
   a. Test Procedure:
      1) Have the Testing Laboratory test the relative density of the subgrade compaction performed in accordance with Method A in AASHTO T 99 and AASHTO T 191, or with ASTM D 2922 and ASTM D 3017.
   b. Acceptance Criteria:
      1) Subgrade compaction having the at least the minimum dry density specified in Table 32 11 00-3 is acceptable.
4. Gradation Test:
   a. Test Procedure:
      1) Have the Testing Laboratory perform Gradation Tests on samples taken from material delivered to the Site at a rate of 1 test for each 300 tons placed, or once a day, whichever is greater.
      2) Sampling will be performed in accordance with the requirements specified in ASTM D 75.
      3) Testing will be performed in accordance with the requirements specified in ASTM C 117 and ASTM C 136.
   b. Acceptance Criteria:
      1) The average value of individual gradation tests for all sieve size determinations must comply with the specified gradations within plus or minus 8 percent for sieves larger than No. 4, within plus or minus 5 percent for sieves No. 30, and within plus or minus 3 percent for sieves No. 200.
5. Moisture Density Test:
   a. Test Procedure:
      1) Have the Testing Laboratory perform Moisture Density Tests on samples taken from material delivered to the Site at a rate of 1 test for each 300 tons placed, or once a day, whichever is greater.
   b. Acceptance Criteria:

1) Material represented by the samples will be acceptable if the compaction meets the specified moisture density criteria.

6. Compaction Test for Crushed Aggregate:
   a. Test Procedure:
      1) Have the Testing Laboratory perform Compaction Tests at a rate of 1 test for each 500 square yards per lift placed.
      2) Testing will be performed as specified in ASTM D 2922 and ASTM D 3017
   b. Acceptance Criteria:
      1) Areas represented by the tests will be acceptable if the compaction meets the specified compaction criteria.
7. Inspections:
   a. When it is believed a deficiency in thickness, or an excess of plasticity exists, take measurements or samples in the same pattern as that defined in Section 32 12 00, Flexible Paving.

C. Non-Conforming Work
1. Correct deficiencies uncovered by the measurements or Samples.
   a. Rework and retest areas represented by noncompliant tests.
   b. Do not add thin layers of material to the top layer of base course to meet the specified grade.
      1) If the elevation of the top layer is 1/2 inch or more below grade, scarify the top layer of the base to a depth at least 3 inches, add new material, and blend and re-compact the material to bring it to grade.
   c. If the finished surface is above the design grade, cut the material back to grade and re-roll the surface.

3.6 PROTECTION

A. Limit traffic on compacted aggregate base course to final surfacing traffic and vehicles applying moisture control.
1. Equipment used to construct adjoining sections may be routed over completed portions of the base course provided no damage results and the equipment is routed over the full width of the base course so rutting or uneven compaction is avoided.

B. Maintain the base course in a condition complying with specified requirements until the Work is accepted.

END OF SECTION

SECTION 32 12 00 - FLEXIBLE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and Division 01 Specification Sections, apply to the Work of this Section.

B. Related Sections include the following:
   1. Section 01 33 00 Submittal Procedures.

1.2 SUMMARY

A. This Section specifies requirements for existing ground preparation and asphaltic concrete paving.

1.3 REFERENCES

A. Reference Standards:
   1. American Association of State Highway and Transportation Officials (AASHTO):
      a. AASHTO T 168 – Standard Method of Test for Sampling Bituminous Paving Mixtures.
      b. AASHTO T 245 – Standard Method of Test for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
   2. ASTM International (ASTM):
      a. ASTM D 29 – Standard Test Methods for Sampling and Testing Lac Resins [withdrawn 2005 without replacement].
      b. ASTM D 36 - Standard Test Method for Softening Point of Bitumen (Ring-and- Ball Apparatus).
      c. ASTM D 464 - Standard Test Methods for Saponification Number of Naval Store Products Including Tall Oil and Other Related Products.
      d. ASTM D 465 - Standard Test Methods for Acid Number of Naval Stores Products Including Tall Oil and Other Related Products.
      e. ASTM D546 Standard Test Method for Sieve Analysis of Mineral Filler for Bituminous Paving Mixtures
      f. ASTM D692 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures
      g. ASTM D946 Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
      h. ASTM D1073 Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
      i. ASTM D1188 Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
      j. ASTM D 2041 - Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
      k. ASTM D2726 Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures

l. ASTM D2950 - 09 Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
m. ASTM D3549 Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens

3. American Wood Preserver's Association (AWPA):
   a. AWPA P5 Standard for Waterborne Preservatives.
   b. AWPA C1 Pressure Treatment.
   c. AWPA C14 Pressure Treatment – Highway.
4. State of New York:
   a. New York State Department of Transportation (NYSDOT):
      i. NYSDOT Standard Specifications (U.S. Customary Units). https://www.dot.ny.gov/main/business-center/engineering/specifications.
      ii. New York State Standard Sheets (U.S. Customary Units). https://www.dot.ny.gov/main/business-center/engineering/cadd-info/drawings/standard-sheets-us.
   b. Official Compilation of the Rules and Regulations of the State of New York (NYCRR).
      i. 12 NYCRR Part 23 - Protection in Construction, Demolition and Excavation Operations.
      ii. 16 NYCRR Part 753 - Protection of Underground Facilities.

1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:
   1. Testing Laboratory:
      a. Metro-North will engage a qualified testing agency to perform tests and inspections as per Section 01 45 29 Testing Laboratory Services.

1.5 SUBMITTALS

A. Action Submittals:
   1. Submit the following to the Engineer for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
      a. Product Data:
         i. Design mix formula to be used.
         ii. Sources of all ingredient materials, copies of all aggregate tests, penetration of the asphaltic cement, and percentages by weight and number of pounds of each of the materials making up the batch.
      b. Certificates:
         i. NYSDOT certified mixing plant to be used. Provide proof of certification.
      c. Special Procedure Submittals:
         i. Specifications of equipment to be used for paving operations.

B. Informational Submittals:
   1. Submit the following to the Engineer for information in accordance with the requirements of Section 01 33 00, Submittal Procedures:
      a. Site Quality Control Submittals:
         i. Test reports, trip tickets, temperature records and other certifications that show materials are in compliance with specifications.
      b. Final density and smoothness test results.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:
   1. Transport asphaltic mixtures in tight vehicles having clean and smooth metal beds.
      a. When necessary, insulate truck bodies.
      b. Just before the vehicles are loaded, lightly coat the inside surface of the vehicles with a whitewash of lime and water, soap solutions, or detergents as approved by the Engineer; or with fuel oil applied by a high pressure fog system.
   2. Cover each load with canvas or other suitable material to protect the mixture from the weather.
   3. Deliver stone at a temperature not exceeding 350°F.

B. Storage and Handling Requirements:
   1. Heating and Storing Asphaltic Paving Mixture Ingredients:
      a. Heat asphaltic cement in approved receptacles to a temperature between 275°F and 350°F.
      b. Keep asphaltic cement uniform in composition and consistency.
      c. Heat aggregate in approved revolving driers.
   2. Hot Asphaltic Mixture Holding Bins:
      a. Store hot asphaltic mixtures at the mixing plant or satellite sites in bins that are currently approved by NYSDOT.
      b. After storage, maintain the mixture as indicated in Table 32 12 00-1.

Table 32 12 00-1 Hot Asphaltic Mixture Storage Requirements

Test Property	Allowable Variation
Temperature	± 20°F from pug mill discharge temperature
Gradation	Within job mix formula tolerance
Asphalt Content	Within job mix formula tolerance
Asphalt Cement Recovered from Mixtures:	
Penetration @ 77°F	Loss not to exceed 50% of the penetration of the asphalt sampled prior to mixing.
Viscosity @ 140°F	Viscosity not to exceed 4 times the viscosity of the asphalt sampled from the plant prior to mixing.

1.7 SITE CONDITIONS

A. Ambient Conditions:
   1. Spread and compact mixtures during daylight.

2. Schedule the placement of asphaltic paving material when the Precipitation Probability from the U.S. Weather Bureau, obtained within 3 hours prior to the start of such operations is less than 50 percent.
   a. Notify the Engineer of the exact time at which the above information was obtained.
3. Do not lay mixtures in wet weather.
4. Do not lay permanent asphaltic mixtures when surface temperatures are below those listed in Table 32 12 00-2:

Table 32 12 00-2 Minimum Surface Temperatures for Laying	
Compacted Lift Thickness	Minimum Surface Temperature
3 inches or greater	40° F
Between 1 inch and 3 inches	45° F
1 inch or less	50° F

   a. Take surface temperatures at 3 locations in the area being paved.
   b. The controlling temperature are the average of the 3 readings.
5. Temporary pavements are not subject to the above requirements, but must be placed as approved by the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Asphalt Cement:
   1. Furnish viscosity grade AC-20 asphalt cement complying with the requirements specified for material designation 702-03 in Section 702 of the NYSDOT Standard Specifications, and with the requirements specified for Penetration Grade 60-70 specified in ANSI/ASTM D946.

B. Coarse Aggregates:
   1. Furnish coarse aggregates complying with the requirements specified in ASTM D692 as amended or supplemented by the requirements specified in Section 401-2.02 of the NYSDOT Standard Specifications.
   2. Furnish coarse aggregates having the gradation specified in Table 32 12 00-1.

C. Mineral Filler:
   1. Furnish finely divided mineral matter, such as rock dust, hydrated lime, hydraulic cement, fly ash, loess, or another material as determined and approved by the Engineer.
   2. Furnish mineral filler sufficiently dry to flow freely and essentially free from agglomerations, organic impurities, and other objectionable materials.

D. Sand:
   1. Conform to the requirements for fine aggregate in ASTM D-1073 and as amended or supplemented by Section 401-2.02 of the NYSDOT Standard Specification.

E. Aggregate Base:
1. Conform to NYSDOT Standard Specifications Section 304, Type 2.

F. Wood Header:
1. Preservative: Wolman CCA Type C in accordance with AWPA Standard P5.
2. Pressure treated to conform to AWPA Standard C1 and C14.

2.2 MIXES

A. Asphaltic Paving Mixture:
1. Provide a bituminous plant mix composed of a mixture of aggregate, filler and bituminous material.
   a. Thoroughly coat the aggregate with asphaltic cement.
2. Provide a bituminous plant mix complying with the requirements indicated in Table 32 12 00-2.

Table 32 12 00-2 Plant Mix Composition

Use	Asphaltic Binder		Asphaltic Surface Course	
Screen Sizes	General Limits % Passing	Job Mix Tolerance %	General Limits % Passing	Job Mix Tolerance %
1-1/2-inch	100	-		-
1-inch	95-100	-		-
1/2-inch	70-90	±6		±7
1/4-inch	48-74	±7		±7
1/8-inch	32-62	±7		±7
No. 20	15-39	±7		±7
No. 40	8-27	±7		±4

Table 32 12 00-2 Plant Mix Composition

Use	Asphaltic Binder		Asphaltic Surface Course	
Screen Sizes	General Limits % Passing	Job Mix Tolerance %	General Limits % Passing	Job Mix Tolerance %
No. 80	4-16	±7		±2

No. 200	2-8	±7		
Asphalt Content %	4.5-6.5±0.4		5.8-7.0±0.4	
Mixing and Placing Temperature Range °F	250°-325°		250°-325°	

3. Base aggregate tolerances on the total weight of the aggregate and the bitumen tolerances on the total weight of the mix.

2.3 SOURCE QUALITY CONTROL

A. Tests:
   1. Gradation Test:
      a. Test Procedure:
         i. Have the Testing Laboratory perform Gradation Tests in accordance with the method specified in ASTM D546.
      b. Acceptance Criteria:
         i. Coarse aggregate and mineral filler meeting the gradation requirements indicated in Table 32 12 00-1 pass the Gradation Test.

Table 32 12 00-1 Coarse Aggregate and Mineral Filler Gradation

Sieve Size	Percent Passing (by Weight)
No. 30	100
No. 80	85-100
No. 200	65-100

B. Non-Conforming Work:
   1. Do not furnish coarse aggregate and mineral filler that fail the Gradation Tests.

PART 3 - PRODUCTS

3.1 PREPARATION

A. Ensure substrates are in suitable condition to receive the work.
   1. Design builder shall clean all existing joints/cracks of all deleterious material in accordance to NYSDOT Section 633, Conditioning Existing Pavement.

2. Design builder shall seal all existing cracks with a joint and crack filler prior to asphalt overlay in accordance to NYSDOT Section 633, Conditioning Existing Pavement and NYSDOT Section 702, Materials and Manufacturing.
3. Design builder shall mill/grind a minimum 3'x3' area of existing asphalt pavement to a depth of 1½" below existing manhole cover elevations at locations where rims are flush with existing pavement prior to asphalt overlay installation.
4. Design builder shall mechanically sweep pavements surfaces immediately prior to commencement of asphalt overlay installation.

B. Protection of In-Place Conditions:
   1. Temporary Pavement:
      a. Furnish and lay temporary pavement wherever required to properly maintain traffic over backfilled trenches and at such other locations as may be directed by the Engineer.
      b. Temporary pavement shall consist of asphaltic binder mixtures, laid to adequate thickness and compaction.

3.2 INSTALLATION

A. Equipment:
   1. Mixing Plants:
      a. Furnish mixing plants approved by NYSDOT for use in NYSDOT construction.
      b. Ensure that the plant and plant operations are in accordance with the requirements of Section 401-3.01 "Quality Control" of the NYSDOT Standard Specifications.
   2. Asphaltic Pavers:
      a. Furnish self-power pavers having an activated screed or strike-off assembly capable of spreading and finishing courses in widths approved by the Engineer.
      b. Furnish pavers capable of spreading and finishing narrow widths of pavement.
      c. Furnish pavers equipped with a receiving hopper with sufficient capacity for uniform spreading operation and automatic flow controls.
      d. Furnish pavers having a heated screed or strike-off assembly to produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.
      e. Furnish pavers equipped with approved automatic transverse slope and longitudinal grade screed controls to automatically adjust the screed and increase or decrease the mat thickness to compensate for irregularities in the surface being paved.
         i. Provide controls capable of maintaining the proper transverse slope and readily adjustable for transitions.
   3. Rollers:
      a. Furnish tandem type power driven rollers capable of providing a pressure not less than 225 pounds per inch width of the main roll.
         i. Furnish smooth true rolls without flat spots or other imperfections.
      b. Furnish self-propelled, pneumatic rubber-tired rollers with wheels mounted, grouped, and spaced to provide uniform coverage with each pass.
         i. Furnish rollers with rear group wheels that do not follow in the tracks of forward group wheel.
         ii. Furnish rollers with a maximum wheel load of 5600 pounds.
         iii. Furnish rollers with a tire compression on pavement, where the area of contact is measured on a hard, unyielding surface, of 80 psi, plus or minus 5 psi, for each wheel; and having a total maximum load per axle, whether single axle or a group of axles in the same alignment, of 22,400 pounds.

iv. Control wheel loads and tire pressures to produce the required degree of compaction without rutting of the surface to be rolled.

B. Headers:
1. Install wood headers where indicated. Brace headers to support ballast until paving is installed.

C. Placing:
1. Place surface courses and binders over aggregate base using an approved mechanical spreader.
   a. Keep the number of longitudinal joints to a minimum.
   b. Limit hand placement of asphaltic material to those areas where machine spreading and finishing is not practical.
2. Ensure the temperature and consistency of the mix at time of application comply with the specified requirements.

D. Spreading:
1. Do not allow the asphaltic mixture to be placed in a continuous strip exceeding 800 feet long.
2. Lay adjacent strips immediately after each previous strip is placed until the full width of the roadway surface has been covered.

E. Binder Mixture:
1. Using an asphaltic paver, lay the binder mixture to a depth which after final compaction is equal to the specified depth.
   a. In areas where the use of the paver is impractical, as determined by the Engineer, other approved means of spreading and compaction may be permitted.
2. Hand Laying Binder Mixture:
   a. Uniformly spread binder mixture using hot iron rakes with tines not less than 1/2 inch longer than the loose depth of the mixture, or using a mechanical spreader, to a depth which, after final compaction, is equal to the specified depth.
   b. Thoroughly compact the binder mixture using approved tamping irons adjacent to curbs, manholes, rails, and similar structures; and with approved rollers to a surface that is parallel to and below the finished grade and crown of the finished surface.
   c. If the binder mixture breaks up, shows lack of bond, or other defects before the surface mixture is laid, take it up, and remove and replace it with suitable material at no increase in the Contract Price.

F. Surface Course Mixture:
1. Before the surface mixture is laid, paint the contact surfaces of curbs, gutters, headers, and manholes with a thin uniform coating of approved hot asphaltic cement, liquid asphalt, or emulsified asphalt.
2. Using an asphaltic paver, lay the surface course mixture to a depth which after final compaction is equal to the specified depth.
   a. In areas where the use of the paver or mechanical spreader is impractical, other approved means of spreading and compaction may be permitted.
3. Hand Laying Surface Mixture:
   a. Uniformly spread surface course mixture using hot iron rakes with tines not less than 1/2 inch longer than the loose depth of the mixture to a depth which, after final compaction, is equal to the specified depth.
   b. No walking will be permitted on the surface mixture during the laying operations.
   c. After spreading and raking the surface mixture, carefully lute surface course mixture from the sides before compaction.

G. Compaction:
1. Rolling:
a. Proceed rolling continuously at the following rates:
i. For binder, base course, and drainage medium mixtures, when spread by hand, not in excess of 400 square yards per hour per roller.
ii. For binder, base course, and drainage medium mixtures, when spread by machine, not in excess of 600 square yards per hour, per roller.
iii. For asphaltic concrete surface mixtures, when spread by hand, not in excess of 300 square yards per hour per roller.
iv. For asphaltic concrete surface mixtures, when spread by machine, not in excess of 400 square yards per hour per roller.
b. Immediately after spreading the mixture, using approved tamping irons thoroughly compact the mixture adjacent to curbs, manholes, and rails; and by rolling using approved rollers continuously from commencement to final completion at a speed not exceeding 3 mph.
c. Make the initial rolling using steel-wheeled, power-driven, tandem type rollers parallel to the center line of the paved surface beginning at the curbs or edges of the paved surface and working toward the center, overlapping on successive trips by one-half the rear wheel of the roller.
d. Immediately following the initial rolling, further compact the mixture by using pneumatic rubber-tired rollers for a minimum of eight passes.
i. Smooth shallow ruts and ridges with tandem rollers immediately following the rubber-tired rolling.
2. Final Roll:
a. Continue rolling until no further compression results; the mixture has cooled; no marks show under the roller; and the surface is smooth and free from depressions, waves, bunches and unevenness.
b. After the mixture has been rolled, test the surface with an approved straight edge and surface testing machine laid parallel to the center line of the paved surface.
3. Vibratory Compaction:
a. When permitted by the Engineer, use vibratory compaction in accordance with Section 402-3.07 "Option 2" of NYSDOT Standard Specifications and Section 402-3.04 "Rollers" of NYSDOT Standard Specifications.
b. Compaction testing requirements are to conform to NYSDOT Standard Specifications Section 402-3.07.

H. Joints:
1. Lay the surface mixture in a continuous operation, and pass the roller over the unprotected end of the freshly laid mixture only when the lying of the course is to be discontinued for such length of time as to permit the mixture to become chilled.
a. Provide for a proper bond with the new mixture by cutting or trimming back the joint to expose an unsealed or granular surface for the full-specified depth of the course.
2. At the end of each day's work, form joints by laying and rolling against boards of the thickness of the compacted mixture, placed across the entire width of the pavement.
3. When the laying of the mixture is resumed, paint the exposed edge of the joint with a thin coat of approved hot asphaltic cement or liquid asphalt, rake a fresh mixture against the joint, thoroughly tamp and roll.
4. Hot smoothing irons may be used for sealing joints.

3.3 SITE QUALITY CONTROL

A. Site Tests:
   1. Test final density and smoothness after rolling and before acceptance.
   2. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
   3. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
   4. In-place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to AASHTO T 168.
      a. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job- mix specifications.
      b. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM 2726.
         i. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
         ii. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
   5. Replace and compact hot-mix asphalt where core tests were taken.
   6. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

B. Non-Conforming Work:
   1. Portions of the completed wearing course that are defective in finish, compression, composition or density, shall be taken up, removed and replaced with suitable material properly laid in accordance with these specifications.

3.4 PROTECTION

A. Traffic:
   1. No traffic of any kind will be allowed on the pavement until permitted by the Engineer.

END OF SECTION

SECTION 32 16 00 - CURBS, GUTTERS, SIDEWALKS, AND DRIVEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and Division 01 Specification Sections, apply to the Work of this Section.

B. Related Sections include the following:
   1. Section 01 33 00 - Submittal Procedures
   2. Section 01 50 00 - Temporary Facilities and Controls
   3. Section 03 10 00 - Concrete Forming and Accessories
   4. Section 03 20 00 - Concrete Reinforcing
   5. Section 03 30 00 - Cast-In-Place Concrete
   6. Section 31 20 00 - Earth Moving
   7. Section 31 23 23 - Compaction Testing and Inspection
   8. Section 32 11 00 - Base Courses
   9. Section 32 12 00 - Flexible Paving

1.2 SUMMARY

A. This Section specifies requirements for:
   1. Various types of curb, gutter, sidewalk, sidewalk ramps, driveways, and alley intersections.
   2. Motorcycle/bike parking at Scarsdale station.
   3. Contraction joints and expansion joints in curb, gutter, sidewalk, sidewalk ramps, driveways, and alley intersections.

1.3 REFERENCES

A. Abbreviations and Acronyms:
   1. NYSDOT: New York State Department of Transportation.

B. Reference Standards:
   1. American Concrete Institute (ACI):
      a. ACI 305R - Guide to Hot Weather Concreting.
      b. ACI 306R - Guide to Cold Weather Concreting.
   2. ASTM International (ASTM):
      a. ASTM C33 - Standard Specification for Concrete Aggregates.
      b. ASTM C150 - Standard Specification for Portland Cement.
      c. ASTM D 448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction
      d. ASTM C 936 - Standard Specification for Solid Concrete Interlocking Paving Units.

e. ASTM D 1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
f. ASTM D 1752 – Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Filler for Concrete Paving and Structural Construction.
g. ASTM D 2628 – Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.

3. State of New York:
   a. New York State Department of Transportation (NYSDOT):
      1) NYSDOT Standard Specifications (U.S. Customary Units). https://www.dot.ny.gov/main/business- center/engineering/specifications.
      2) New York State Standard Sheets (U.S. Customary Units). https://www.dot.ny.gov/main/business-center/engineering/cadd-info/drawings/standard-sheets-us.
4. United States Government:
   a. Americans with Disabilities Act. (Pub. L. 101–336, 104 Stat. 327, 42 U.S.C. 12101–12213 and 47 U.S.C. 225 and 611) [ADA].
   b. Buy America Act (Pub. L. 103–429, 49 U.S.C. 5323(j))
   c. Department of Justice:
      1) 2010 ADA Standards for Accessible Design,
      2) 28 CFR 35 - Nondiscrimination on the Basis of Disability in State and Local Government Services
      3) 28 CFR 36 – Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities.
   d. Federal Transit Administration (FTA):
      1) 49 CFR 661 Buy America Requirements.
   e. United States Code:
      1) 42 U.S.C. Sections 12101–12213.
         a) Equal Opportunity for Individuals with Disabilities.
            (1) Americans with Disabilities Act of 1990 (ADA) [P.L. 101-336].
            (2) ADA Amendments Act of 2008 [P.L. 110–325]
      2) 49 U.S.C. Section 5323(j).
         a) Buy America Act [P.L. 103–429].

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Depending on where the curb, gutter, sidewalk, sidewalk ramp, driveway, motorcycle/bike parking, or alley entrance construction is to occur and the owner of the right-of- way, coordinate with and obtain the required approvals from the appropriate State and municipal departments, including but not limited to, the following:
   a. New York State Department of Transportation (NYSDOT).
   b. Local authority having jurisdiction over public streets.
   c. Metro-North.
2. Adhere to each owner's specifications and/or permits, and comply with additional requirements of the owners, regarding the Work of this Section.
3. If the owner of the right-of- way is other than the Metro-North, the identity of the owner of the right-of-way will be provided on the Contract Drawings.

B. Sequencing:
1. Include provisions for traffic control during concreting operations in the Traffic Control Plan required by Section 01 50 00, Temporary Facilities and Controls, including provisions for the placement and maintenance of barriers required to protect the curbs, gutters, sidewalks, sidewalk ramps, driveways, and alley entrances from traffic for a minimum of 7 days after concrete placement. Protect motorcycle/bike parking permeable pavers as directed by the manufacturer.

1.5 QUALITY ASSURANCE

A. Certifications:
1. Expansion Joint Filler Certificates of Compliance:
a. Prepare Certificates of Compliance for the expansion joint filler that include the following information:
1) Description of material supplied.
2) Quantity represented by the Certificate.
3) A means of identifying the material, such as a label, lot number, or marking.
4) A statement certifying the material complies with the requirements of specifications cited.
5) The name, title and signature of a person having the authority to bind the manufacturer or Supplier of the material.
b. Submit the Certificates of Compliance for the expansion joint filler to the Engineer for approval.

B. Site Samples:
1. Granite Curbing:
a. Sample the granite curb materials containing discoloration other than cleanable surface stains, and submit the Samples to the Engineer for evaluation.
2. Permeable Pavers
a. Provide permeable paver Samples to the Engineer for approval.

1.6 SUBMITTALS

A. Action Submittals:
1. Submit the following to the Engineer for approval in accordance with the requirements of Section 01 33 00, Submittal Procedures:
a. Product Data:
1) Concrete.
2) Expansion joint filler.
3) Granite Curbs.
4) Detectable warnings on sidewalks.
5) Permeable Pavers.
b. Shop Drawings:
1) Working Drawings for the curb, gutters, sidewalks, sidewalk ramps, driveways, and alley entrances.
2) Detectable warnings on sidewalks.
3) Motorcycle/bike parking area.
c. Samples:
1) Discolored granite curbing.

2) Permeable pavers.

d. Certificates:

1) Certificates of Compliance for expansion joint filler.

e. Special Procedure Submittals:

1) Manufacturer's data for machinery used in lieu of conventional concrete forms.

B. Informational Submittals:

1. Submit the following to the Engineer for information in accordance with the requirements of Section 01 33 00, Submittal Procedures:

a. Special Procedure Submittals:

1) Sidewalk, Curb, or Driveway Permits.

b. Manufacturer's Reports:

1) Manufacturer's data for machinery used in lieu of conventional forms.

1.7 SITE CONDITIONS

A. Ambient Conditions:

1. Cold Weather Concreting:

a. Perform cold weather concrete work in accordance with the requirements of ACI 306R.

2. Hot Weather Concreting:

a. Perform hot weather concrete work in accordance with the requirements of ACI 305R and the following additional requirements:

1) Do not deliver concrete having a temperature exceeding 90 degrees Fahrenheit to the Work Site.

2) Cool the mix's ingredients before mixing to prevent the temperature of the mix from exceeding 90 degrees Fahrenheit.

3) Furnish windbreaks, shading, fog spraying, sprinkling, or wet covering when necessary.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Buy America Act:

1. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.

2.2 DESIGN CRITERIA

A. Paving for Parking Areas and Access Drives

1. In accordance with the local Construction Code, provide paving for parking areas and access drives capable of withstanding a wheel load of at least 4,000 pounds unless otherwise indicated in the Contract Documents.

a. Construct the base course of non-absorbent approved material rolled or compacted to grade.

b. Bring the wearing surface to a smooth but non-slip, non-dusting finish; and maintain it in this condition.

c. Provide finished pavement composed of 1-1/2-inch trap rock penetrated with 1-1/2 to 2 gallons of asphaltic oil per square yard of paved area, and equal to at least a 4-inch compacted thickness of bituminous macadam.

B. Permeable Pavers
1. As indicated in Section 01 11 00 Summary of Work, provide a motorcycle/bike parking area at the inbound side of Scarsdale Station. The location is indicated on the Contract Drawings.
2. Motorcycle parking is to consist of 15 spaces 3.3’ wide x 6.5’ long and is to be constructed of permeable pavers.

C. Pedestrian Ramps:
1. Provide pedestrian ramps complying with Americans with Disabilities Act (ADA), the local authority having jurisdiction, and New York State Department of Transportation (NYSDOT) standards.

D. Submit Product Data for the materials proposed for the Work of this Section to the Engineer for approval.

E. Submit Shop Drawings for any curb, gutters, sidewalks, sidewalk ramps, driveways, motorcycle. Bike parking area, and alley entrances to the Engineer for approval.

2.3 MATERIALS

A. Caulking Compound:
1. Provide a colored caulking compound matching the concrete color.
2. Caulking Compound Manufacturers:
a. Euclid Chemical Company, http://www.euclidchemical.com/.
b. Manufacturer providing an equivalent product as approved by the Engineer.

B. Concrete and Concrete Reinforcing:
1. Provide concrete reinforcing complying with the requirements specified in Section 03 20 00, Concrete Reinforcing.
2. Provide concrete complying with the requirements specified in Section 03 30 00, Cast-In-Place Concrete.

C. Permeable pavers to be Eco Prioria (or approved equal) in “Natural” color (match “Natural” from Eco Prioria if using approved equal)p arranged in a Herringbone pattern as shown in the Contract Drawings.
1) Permeable pavers shall have a compressive strength of at least 8000 psi.
2) Permeable pavers shall have a maximum water absorption of 5%.
3) Permeable pavers shall meet or exceed ASTM C 936.
4) Permeable pavers shall be 4” x 8” each.

D. Concrete Release Agent:
1. Provide a liquid or powdered release agent.
a. Powdered Release Agent: Provide a clear or pigmented water- repellent powder capable of forming a lubricant barrier between fresh concrete and mat stamping tools for easy release.
b. Liquid Release Agent: Provide a parting agent capable of keeping stamping tools from sticking to wet concrete.

2. Liquid Concrete Release Agent Manufacturers:
   a. Super Stone Inc., http://www.superstone.com/.
      1) Super Stone Release Powder.
      2) Super Stone Bubble Gum Liquid Release®.
   b. Manufacturer providing an equivalent product approved by the Engineer.

E. Concrete Sealer:
1. Provide a waterproofing concrete sealer that will become a permanent part of the concrete matrix itself.
2. Concrete Sealer Manufacturers:
   a. Endur-O-Seal USA, Inc., http://enduroseal.com/index.html.
   b. Manufacturer providing an equivalent product approved by the Engineer.

F. Detectable Warnings:
1. Provide detectable warnings tiles manufactured from a colorfast and UV-stable, homogenous glass and carbon composite.
2. Surface Applied Detectable Warnings:
   a. Provide 1/8-inch thick surface applied detectable warnings tiles with beveled edges, fiberglass truncated domes, and designed to be secured with color matched fasteners and structural adhesive or pressed into place in freshly poured concrete.
3. Cast-In-Place Detectable Warnings:
   a. Provide nominal 1/4-inch thick cast-in-place tiles having embedment ribs 3 inches apart on center through the entire length of tile.
4. Detectable Warnings Manufacturers:
   a. ADA Solutions, Inc., http://www.adatile.com/.
      1) For new construction, provide 24"x60"Cast-in-Place Composite Tactile with 2.35" dome spacing.
      2) For retrofitting existing ramps, provide 24"x60" Surface Mount Composite Tactile with 2.35" dome spacing.
   b. Strongwall Industries, Strongwarn http://www.strongwall.com/system-information.html
   c. Armor-Tile, https://www.armor-tile.com/
   d. Manufacturer providing an equivalent product approved by the Engineer.
5. Submit Shop Drawings and Product Data for detectable warnings to the Engineer for approval.

G. Expansion Joint Filler:
1. Provide expansion joint filler complying with the material requirements specified in NYSDOT Standard Specification Section 705 Joint Materials and ASTM D 1751, ASTM D 1752, or ASTM D 2628.

H. Stone Curbing:
1. Provide granite or bluestone curbing complying with the requirements specified in NYSDOT Standard Specification Section 714-01 Stone Curb.
2. Provide granite that is sound and durable, free from seams which impair its structural integrity, and of a smooth splitting and machining character.
   a. Natural color variations that are characteristic of the deposit are acceptable.
3. Cut curb materials indicated on the Contract Drawings to conform to the shape and size shown on New York State Standard Sheet 609-01 Stone Curb and Granite Curb and as indicated on the Contract Drawings and herein.

2.4 ACCESSORIES

A. Concrete Formwork:
1. Provide concrete formwork complying with the requirements specified in Section 03 10 00, Concrete Forming and Accessories.

PART 3 - PRODUCTS

3.1 EXAMINATION

A. Verification of Conditions:
1. Inspect the locations intended to receive cast-in-place concrete for deficiencies which would prevent proper execution of the concrete work.

B. Evaluation and Assessment:
1. Do not proceed with concrete placement until deficiencies discovered by inspection are corrected to the satisfaction of the Engineer.

3.2 PREPARATION

A. Protection of In-Place Conditions:
1. Obstructions to Access:
a. Do not place excavated material where it will interfere with access to property or traffic flow in the street.
2. Pedestrian and Vehicular Traffic:
a. Adequately protect pedestrian and vehicular traffic by furnishing suitable protective barricades and lighted red lanterns around the work, and arrange the work so inconvenience, delay, and hazard to pedestrian and vehicular traffic is minimized.
1) Erect and maintain suitable barricades and fences around the work area while excavation or other work is in progress.
2) The local authority may require that the Work be arranged to make it possible to completely remove obstructions to traffic on Saturdays, Sundays, holidays, and at the discretion of the authority, during periods of unusually heavy traffic volume.
a) If this requirement is not complied with, the local authority may backfill and temporarily resurface all or part of the work covered by the Street Opening Permit using its own forces, or another contract, or otherwise; and the Contractor will be completely responsible for reimbursing the local authority for expenses incurred thereby.
3) Provide warning flags or signs and suitably lighted flashing lights.
4) Provide a watchman if so ordered by the local authority.
5) If interference with the free flow of traffic occurs, designate competent persons to direct and expedite traffic by means of lights or flags.
6) Unless otherwise authorized by the Local authority, maintain vehicular traffic at all times during the progress of the work being performed under the Street Opening Permit.
3. Existing Structures:
a. At least 24 hours before commencing street openings or work to be done under the provisions of a street opening permit, give written notice of street opening to any

company whose pipes, conduits, or other structures are laid in the street in which the work is.

b. Carefully support, maintain in operation, and protect from injury pipes, conduits, or other structures; and, in case of injury, restore the pipes, conduits, or other structures to as good a condition as they were before the beginning of such opening or work.

B. Surface Preparation:
1. Construct and compact the subgrade true to grades and lines shown on the Contract Drawings and as specified in Section 31 20 00, Earth Moving.
a. Remove soft or unsuitable material to a depth not less than 6 inches below the subgrade elevation, and replace it with material acceptable to the Engineer.
b. If the Engineer determines that the existing subgrade consists of soils with swelling characteristics, bring the moisture content as close as possible to the optimum required for compaction.
1) Obtain optimum moisture content by the addition of water, by the addition and blending of dry suitable material, or by drying the existing material.
c. Compact the subgrade to a relative density of 90 percent minimum.

C. Demolition / Removal:
1. Sidewalk, Curb, and Driveway Removal:
a. Cut existing pavements and concrete joined to new construction.
1) Smoothly saw cut concrete to neat, straight, vertical, true lines so the adjoining surface will not be damaged.
a) The minimum depth of cut is 1-1/2 inches or 1/4 of the thickness (D/4), whichever is greater.
b) Clean-cut asphalt concrete only with approved equipment and methods
(1) Paint trimmed edges with a light coating of asphalt cement or emulsified asphalt immediately prior to constructing the new abutting asphalt concrete.
c) Do not rip or root outside the limits of cuts.
2) Remove existing concrete sidewalks and driveways that abut the new sidewalks and driveway entrances to a distance required to maintain the slope, or where sidewalks are concerned not to exceed 1-inch per foot.
3) Saw cutting is required at the match lines.
b. Do not place material displaced by the construction on the base and/or surfacing material already in place on adjacent roadways.
2. Excavation:
a. Store excavated material in neat piles, placed so interference with the use of the roadway or sidewalks is minimized.
b. If so ordered by the Local authority, promptly remove excavated material from the site of the work.

3.3 SIDEWALK, CURB, MOTORCYLE PARKING AND DRIVEWAY CONSTRUCTION

A. Construct or replace sidewalks, curbs, and driveways in accordance with the grades and specifications determined or promulgated by the local authority having jurisdiction; and perform the Work so it meets the grade and alignment of the adjoining sidewalk, curb, and driveway and/or established lines and grades.
1. Follow the current standard specifications, and obtain prior approval from the local authority having jurisdiction.

B. Sheathing and Shoring:
   1. Except where the excavation is in rock or otherwise authorized by the local authority having jurisdiction, in trenches in excess of 3 feet deep place tight sheathing at least 2 inches thick and securely fasten it in place with whalers and braces for the duration of the work
      a. Drive the sheathing to the same depth as the lowest part of the pipe, conduit, or structure proposed to be installed.
      b. Carry sheathing down so the bottom of the sheathing is not more than one foot above the bottom of the excavation.
      c. If the horizontal distance from the edge of a proposed excavation to the nearest edge of the pavement, water main, or other surface or subsurface structure is more than the vertical depth of the proposed excavation measured from the highest point of the pavement, water main, or other surface or subsurface structure, the Authority may authorize omitting the sheathing and shoring in whole or in part.
   2. Whenever conditions make it necessary, the Authority may require that the sheathing be driven ahead of the excavation as the excavation proceeds.
   3. Unless otherwise authorized in writing by the Authority, leave sheathing and shoring in place with a cutoff line 18 inches below the ground surface.

C. Portland Cement Concrete Curbs, Gutters, Sidewalks, and Driveways:
   1. Concrete Formwork:
      a. Furnish conventional concrete forms as specified in Section 03 10 00, Concrete Forms and Accessories, unless otherwise approved.
         1) Carefully set forms that conform to the dimensions of the curb, gutter, sidewalk, sidewalk ramp, driveway, or alley entrance to line and grade, and securely stake them into position.
         2) Water the forms and subgrade immediately in advance of placing concrete.
         3) Clean forms thoroughly each time they are used.
         4) Coat forms with a light oil or other releasing agent which will not discolor the concrete.
      b. Construct concrete curbs and gutters by using conventional concrete forms, or when approved by the Engineer by means of an appropriate machine.
         1) If applicable, submit the manufacturer's data for machinery used in lieu of conventional forms to the Engineer for approval of the equipment.
      c. All construction requirements applicable to the use of conventional forms also apply to the use of the machines.
         1) If machines approved by the Engineer and specifically designed for such Work are used, the results must be equal to or better than those produced by the use of conventional forms.
         2) If the results are unsatisfactory to the Engineer, discontinue using the machines and make necessary repairs at no increase in Contract Price.
   2. Placing Concrete:
      a. Place the concrete in the forms.
      b. Spade concrete away from the forms so there will be no rock pockets next to the forms.
      c. Compact concrete using mechanical vibrators approved by the Engineer.
      d. Continue tamping or vibrating the concrete until mortar flushes to the surface, and the coarse aggregate is below the concrete surface.
   3. Finishing and Curing Concrete:
      a. Finish and cure the concrete as specified in Section 03 30 00, Cast-In-Place Concrete.

D. Formwork Removal:

1. Exercise care to prevent damage when removing concrete forms.
2. Do not remove the front face form before the concrete has taken initial set and has sufficient strength to carry its own weight, no sooner than 7 days or as determined by the Engineer.
3. Do not remove gutter forms and rear forms until the concrete has hardened sufficiently to prevent damage to the edges.

E. Expansion Joints:
1. Unless otherwise specified or shown, construct expansion joints in accordance with the local authority and New York State Department of Transportation (NYSDOT) standards.
2. Construct expansion joints in a straight line and vertical plane perpendicular to the longitudinal line of the sidewalk, curb, or gutter except, in the case of a curved alignment, construct expansion joints along radial lines of the curve.
3. Construct expansion joints to the full depth and width of the concrete, and match the joints in the adjacent pavement, sidewalk, curb, or gutter.
4. Extend the expansion joint material through the concrete from the surface to one inch into the subgrade.
5. Construct expansion joints at all radius points, driveways, alley entrances, and at adjoining structures.
    a. Construct expansion joints with a maximum interval of 100 feet between joints.

F. Contraction Joints:
1. Unless otherwise specified, construct contraction joints in accordance with the local authority and New York State Department of Transportation (NYSDOT) standards.
2. Construct contraction joints in a straight line and vertical plane perpendicular to the longitudinal line of the sidewalk, curb, or gutter, except, in the case of a curved alignment, construct contraction joints along radial lines of the curve.
3. Construct contraction joints to a depth of 1-1/2 inches at 10 foot intervals on all sidewalks regardless of the width.
4. Unless an expansion joint is required, construct contraction joints to coincide with each form joint.
5. Provide sidewalk score marks at least 1/2 inch deep at the mid-point of the contraction joint.

G. Edges:
1. Shape all edges with a suitable tool formed to round the edges to a radius as indicated on the local authority and New York State Department of Transportation (NYSDOT) standard drawings.

H. Depressed Curbs for Driveway Entrances:
1. If approved in writing by the local authority, existing curbs may be cut or lowered to provide driveway entrances or exits.
    a. Do not cut bluestone and granite curbs, but lower them in an acceptable manner.
    b. If authorized by the Engineer, concrete curbs may be cut provided the cutting can be satisfactory done.
2. Do not cut or lower existing curbs, or construct new depressed curbs, to provide driveway entrances or exits unless in each case an adequate driveway ramp or apron is provided and installed between the curb and the abutting property line, and extends over the entire width of the existing or proposed driveway.
3. Satisfactory surface the driveway ramp or apron with 7-inch thick reinforced concrete, or macadam at least 4 inches thick, or at least 2 inches of bituminous surfacing material laid over 4 inches of crushed stone.
4. The depressed curb cannot be longer than the limits established by the Local authority.

5. Unless otherwise authorized, construct the portion of the driveway ramp or apron common with the sidewalk from 7-inch thick reinforced concrete.
6. Where depressed curbs or portions of depressed curbs are no longer used or needed for driveway entrance purposes, raise and restore the depressed curbs or portions thereof to their full height to conform with adjoining curbs or to the grade established by the Local authority.

I. Sidewalks:
   1. Provide concrete sidewalk, including pedestrian ramps, at the locations shown on the Contract Drawings or as directed by the Engineer.
      a. Locate expansion joints at existing joints of adjacent sidewalks, at street light and utility pole bases, and other structures where possible.
         1) Space expansion joints no more than 20 feet apart.
   2. Standard Concrete Sidewalk:
      a. Finish the sidewalks to have a broom finish in one direction, at right angles to the adjacent form work.
         1) Finish the sidewalks using a magnesium float instead of a wood float.
      b. To cure the concrete, in lieu of linseed oil apply a curing material immediately after finishing the concrete, and cover the concrete with polyethylene sheeting for 3 days.
         1) Spray 2 coats to apply a combined coverage of 250 square feet per gallon, or roll 1 coat at the rate of 250 square feet per gallon, in accordance with the manufacturer's recommendations.
         2) Curing Material Manufacturers:
            a) Durok Building Materials, Inc.
            b) Manufacturer providing an equivalent product approved by the Engineer.
      c. Where directed by the Engineer, saw cut sidewalks to a minimum depth of 2 inches and having neat and sharp edges using a power unit having single or multiple rotary blades.
   3. Detectable Warnings on Sidewalks:
      a. Provide detectable warnings on sidewalk curb ramps and other locations as detailed in the Contract Documents or as directed by the Engineer.
         1) On pedestrian curb ramps and blended transitions include detectable warnings surfaces in complying with the latest ADA Standards for Accessible Design, local authority, and New York State Department of Transportation (NYSDOT) standards.

J. Backfilling:
   1. Do not backfill until the work being done has first been inspected, and the backfilling has been authorized by the local authority having jurisdiction.
      a. If backfilling occurs before the work has been inspected, the Engineer can require the Contractor to uncover the work at no increase in the Contract Price so proper inspections can be made.
   2. Unless otherwise specified, backfill behind the curbs, sidewalk, or sidewalk ramps with soil native to the area and to the lines and grades shown on the Contract Drawings.
   3. To backfill the bottoms of trenches, provide clean earth, sand, or rock dust containing no broken rock, stone, or frozen earth up to 2 feet above the completed pipe or other structure.
      a. For the backfill placed 2 feet and higher above the top of a completed pipe or other structure, provide approved material containing no frozen earth, consisting of less than one-third broken rock, and having no stones exceeding 1/2 cubic foot in size.
   4. Pack the space between and the bottom and sides of the trench and the pipe or other structure by hand until full, and thoroughly tamp the material as fast as it is placed up to the top of the

pipe or other structure; then by hand carefully deposit and tamp the backfill cover material in layers not more than 6 inches thick to at least 3 feet higher than the top of the pipe or other structure.

a. Furnish a light tamper weighing from 6 to 8 pounds for tamping, and perform the tamping so compacted backfill is secured without injuring or disturbing the completed pipe or structure.
b. Use at least one worker for tamping for each worker engaged in backfilling.

5. Backfill above the 3 feet above the top of the pipe or other structure in successive horizontal layers not exceeding 6 inches in depth, and thoroughly compact each layer using approved pneumatic tamping equipment or other means approved by the local authority.
6. Do not use power equipment or other mechanical means for backfilling unless measures for adequately compacting the backfill material have been furnished, and then only with the prior written authorization of the local authority.
7. Except with the prior written authorization of the local authority, do not use flooding or puddling with water to compact the backfill.

K. Motorcycle/bike parking area
1. Prepare surface for permeable pavers as indicated by the manufacturer, and complying with the below requirements.
1) Excavate unsuitable subgrade material, and compact as required by Section 32 10 00 and Section 31 23 23.
2) Place minimum of 6” of ASTM No. 2. Subbase.
3) Place minimum of 4” of ASTM No. 57 open graded base.
4) Place bedding course of aggregate material conforming to ASTM No. 8 or No. 9 to a uniform depth of 1 ½” to 2”.
5) Install edge restraints if needed as indicated by the manufacturer’s instructions.
6) Install permeable pavers with joints of approximately 1/4”.
7) Where required, cut pavers with an approved cutting device to fit neatly in the parking area.
8) Tamp pavers with a compactor to uniformly level and free of movement.
9) Apply a thin layer of aggregate material conforming to ASTM No. 8 or No. 9 over the entire paving area and make final pass of the compactor to fill the joints.
10) Sweep and remove excess joint fill.

L. Tolerances:
1. Curb, gutter, and motorcycle/bike parking area: 1/4 inch when measured with a 10 foot straight edge.
2. Sidewalk and Sidewalk Ramps: 1/8 inch when measured with a 5 foot straight edge.

3.4 REPAIR/RESTORATION

A. Repair sidewalks, curbs, and driveways in accordance with the grades and specifications determined or promulgated by the local authority; and perform the Work so it meets the grade and alignment of the adjoining sidewalk, curb, and driveway and/or established lines and grades determined by the local authority.
1. Follow the current standard specifications of the local authority, subject to the prior approval of the local authority.

B. Repair any portion of concrete damaged while stripping forms; or if the damage is severe, replace the concrete at no additional increase in Contract Price.

C. Remove and replace any section of the Work deficient in depth or not conforming to the Contract Drawings or Specifications at no additional increase in Contract Price.

D. Temporary Resurfacing:
   1. Immediately after backfilling excavations, place an acceptable temporary resurfacing on them.
      a. Maintain temporary resurfacing even with the roadway or other surface as directed until permanent restoration of the surface is completed and approved by the Local authority having jurisdiction.
   2. Provide temporary resurfacing consisting of not less than 2 inches of approved premixed bituminous paving material, or if permitted by the local authority provide 6 inches of temporary concrete flush to surface; except where top soil, seeded areas, or sod have been disturbed by the excavation or other work, restore the entire ground area to the same condition as existed before the work began.

E. Permanent Restoration:
   1. Do not permanently restore the surface over a street opening excavation until satisfactory settlement of the backfill has taken place and approved by the local authority having jurisdiction and Construction Commission.
   2. Complete the permanent pavement no later than the date indicated on the Street Opening Permit.

F. Concrete Pavement Restoration:
   1. Before proceeding with concrete pavement resurfacing, neatly cut the existing concrete pavement back a distance not less than 18 inches beyond the edges of the excavation, taking care not to remove any existing steel reinforcement.
      a. Do not reduce this distance without prior approval of the local authority having jurisdiction.
      b. Under the following conditions, increase this distance:
         1) Where existing pavement has been undermined by the excavation or by other work, or where spalled or scaled surface areas of existing pavement adjoin the area to be resurfaced, remove additional pavement beyond the distance specified as ordered by the Engineer.
         2) If a portion of the proposed concrete resurfacing, as finally determined by the Engineer, is nearer than 4 feet from a joint, extend the removal to the joint.
         3) The smallest horizontal dimension of the concrete resurfacing cannot less than 4 feet.
   2. Do not disturb exposed subgrade unless, in the opinion of the Engineer, the subgrade is unstable.
      a. If the subgrade is unstable, remove the unstable material as ordered, and replace it with approved stable material in layers not exceeding 4 inches thick, and thoroughly compact and tamp each layer.
   3. Uniformly plumb and tool the upper edges of the existing concrete pavement to a depth no more than one inch leaving the remaining depth with straight but rough edges.
   4. Place deformed steel bar reinforcement, not less than 3/8-inch in size, 2 inches above the subgrade, spaced as ordered, and adequately tied in with the existing reinforcement, if any.

5. Immediately prior to the placing of the new concrete resurfacing, thoroughly wash, wire brush, dampen, and paint the edges of the existing concrete pavement with a 1:1 neat cement coating.
6. Proportion, mix, place, finish, and cure the concrete as ordered.
    a. The Engineer may require using an approved, high early- strength, cement placed under approved methods.
    b. Using admixtures and work in freezing weather is allowed only with the Engineer's prior approval and as directed.
7. Install approved joints where directed.
8. Do not open the resurfaced area to traffic until so ordered by the Engineer.

G. Bituminous Pavement Restoration:
1. Prior to replacing bituminous pavements, properly prepare the subgrade and place a reinforced concrete foundation of the required thickness and proportions on it in accordance with the requirements for concrete pavements specified herein.
2. Neatly cut the existing bituminous pavement back a distance not less than 6 inches from the edges of the new concrete foundation.
    a. Thoroughly clean the entire exposed foundation in an acceptable manner, place a new bituminous pavement surface of approved type and thickness on the foundation, and roll the bituminous pavement in an acceptable manner.

H. Macadam Pavement Restoration:
1. Cut back the existing macadam pavement not less than one foot beyond the edges of the excavation.
    a. Do not reduce this distance without prior approval of the Local authority having jurisdiction.
    b. If the existing pavement has been undermined by excavation or by other work, the Local authority having jurisdiction may increase this distance.
2. Place 4 inches of approved crushed stone of the required size, properly tamp the crushed stone, then place 2 inches of asphaltic concrete on the subgrade, and compact and finish the asphaltic concrete in an acceptable manner.

I. Removed Trees:
1. If in order to construct, replace, or repair a sidewalk or driveway, it is necessary to remove a tree on city property, furnish and plant a new tree for each tree removed, of a species and size acceptable and in an approved location, in front of or adjoining the property.

3.5 SITE QUALITY CONTROL

A. Site Tests:
1. Curb, Gutter, and Motorcycle/Bike Parking Area Tolerance Test:
    a. Test Procedure:
        1) With a 10-foot straight edge or curve template, the face, top, back, and flow line of the curbs and gutters will be checked longitudinally along the surface to verify they are constructed as indicated on the Contract Drawings within the allowable tolerances.
    b. Acceptance Criteria:
        1) Curbs and gutters having deviations within the specified allowable tolerance are acceptable.
2. Sidewalk and Sidewalk Ramp Tolerance Test:

a. Test Procedure:
1) With a 5-foot straight edge, the sidewalks and sidewalk ramps will be checked to verify they are constructed as indicated on the Contract Drawings within the allowable tolerances.
b. Acceptance Criteria:
1) Sidewalks and sidewalk ramps having deviations within the specified allowable tolerance are acceptable.
3. Gutter Drainage Test:
a. Test Procedure:
1) Gutters that have a slope of 0.8 foot per hundred feet or less and gutters having unusual or special conditions that cast doubt on the capability of the gutters to drain may be tested by applying water from a hydrant, tank truck, or other source to establish the flow in the length of gutter to be tested on a dry day.
2) 1 hour after the supply of water is shut off, the gutter will be inspected for evidence of ponding or improper shape.
b. Acceptance Criteria:
1) Ponded water in the gutter or on adjacent asphalt pavement to a depth of more than 1/2 inch is unacceptable.

B. Site Inspections:
1. Granite curbing will be inspected for dimensional compliance at the Site by the Engineer.

C. Non-Conforming Work
1. Correct any deviations in curbs, gutters, sidewalks, and sidewalk ramps in excess of the specified allowable tolerances at no increase in Contract Price.
a. Granite curbing not in compliance with the dimensions on the Contract Drawings or New York State Standard Sheet 609-01 Stone Curb and Granite Curb will be rejected by the Engineer.
2. If water is found ponded in gutters or on adjacent asphalt pavement to a depth of more than 1/2 inch, correct the defect or defects in a manner acceptable to the Engineer at no increase in contract Price.
3. Permitted Work by Local Authority:
a. The local authority having jurisdiction may, at his discretion, cause work contemplated in this Section that is covered by City permits to be done by the City's own forces, by contract, or otherwise, in which case the City must be reimbursed for any expense thereby incurred, and the Contractor may make no claim against the City for loss of anticipated profits or other losses.

3.6 CLEANING

A. Waste Management:
1. Haul demolished surface materials away from the Site as soon as practical, and do not use them as backfill.

3.7 PROTECTION

A. Plates:

1. Furnish plates over open excavations for the minimum possible time, and only when specifically requested when applying for Street Opening Permits, or at other times when directed by the local authority having jurisdiction.
   a. Adequately anchor plates to assure covering the street opening.
   b. Do not use vertical projecting lifting devices.
   c. The Engineer, in order to reopen a street to the motoring public, has the right to require temporary pavement to be provided in lieu of plating.
2. From December 1 up to and including March 31 of each year, unless another time period is indicated, comply with the following additional requirements:
   a. Pay a per diem fee to the local authority as may be required.
   b. Place signs as follows.
      1) Provide highly reflective orange diamonds signs that are 2 feet on each side, have black letters and a black border, and are mounted so the lowest point of the sign is 7 feet above the curb or ground surface.
      2) Provide signs that have a 3/8-inch margin and a 5/8-inch border, and 5-inch tall letters placed so that one word is centered over the other.
   c. Facing oncoming traffic and 5 feet before the plate, place a sign reading “RAISE PLOW”.
   d. 200 feet before the plate, and at side streets closer than 50 feet, place signs reading "PLATE AHEAD”.
      1) This sign can be required at any time during the calendar year, or be waived at the discretion of the Engineer.

END OF SECTION

SECTION 32 17 23 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and Division 01 Specification Sections, apply to the Work of this Section.

1.2 SUMMARY

A. This section specification covers the requirements for pavement markings where required.

1.3 REFERENCES

A. Reference Standards:
   1. Federal Highway Administration (FHWA):
      a. Manual on Uniform Traffic Control Devices (MUTCD)
   2. New York State Department of Transportation (NYSDOT)
      a. New York State Supplement to the Manual on Uniform Traffic Control Devices
      b. Standard Specifications
      c. Standard Details

1.4 ADMINISTRATIVE REQUIREMENTS

A. Division 01 Administrative Requirements apply to the Work of this Section.

B. Schedule system installations after coordination with Engineer, and the local Traffic Authority.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Material and equipment under this section shall be by manufacturer regularly engaged in work of this magnitude and scope for minimum of five years.

B. Acceptance of material will be based on the manufacturer's certificate of compliance with the NYSDOT Standard specification requirements.

C. All pavement markings material shall conform to NYSDOT Standard Specification Section 106 – Control of Material.

D. Deliver all pavement marking material packed and protected for timely installation, minimizing on-site storage time.

E. Pre-installation conference: Closely coordinate tolerances required in this section for completely coordinated and smooth installation.

F. Installer must be regularly engaged in work of this magnitude and scope for minimum of five years.

G. All work shall conform to all applicable codes.

1.6 SUBMITTALS

A. All submittals are to be in accordance with requirements of Section 01 33 00 - Submittal Procedures.

B. Action Submittals: Product Data, Certificates and Pavement Markings Design Plans shall conform to NYSDOT Standard Specification Section 685 – Epoxy Reflectorized Pavement Markings.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Ensure that copy of the manufacturer's Certificates of Compliance with NYSDOT Standard specification requirements is provided with each delivery of materials, components, and manufactured items that are accepted by certification. Only NYSDOT approved materials shall be accepted for the pavement markings.

B. Storage and Handling Requirements: Load, transport, unload, store pavement markings materials so that the material is kept clean and free from all damage in handling.

1.8 SITE CONDITIONS

A. Existing Conditions: If pavement marking placement conflicts with existing conditions, obtain Resident Engineer approval to adjust location.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Comply with NYSDOT Approved List for Materials and Equipment of Manufacturers and /or Suppliers issued by the Materials Bureau.

B. For a list of approved pavement markings materials refer to the NYSDOT Approved List for Materials and Equipment of Manufacturers and /or Suppliers:
https://www.dot.ny.gov/divisions/engineering/technical-services/materials-bureau/materials-and-equipment

2.2 DESCRIPTION

A. Epoxy reflectorized pavement markings and all other markings material shall conform to NYSDOT Standard Specification Section 685 – Epoxy Reflectorized Pavement Markings.

B. Regulatory Requirements:
   1. Buy America Act:
      a. Except for those products which are exempt under the specific statutory waivers stipulated in 49 CFR 661, all other products supplied under this Section must comply with the requirements of the Buy America Act.
      b. Items containing steel and /or iron have specified use restrictions under §106-11, Buy America, of the Standard Specifications. The appearance of a material of non-domestic origin on NYSDOT Approved List in no way implies its universal acceptability for use. The Contract documents govern.

2.3 DESIGN CRITERIA

A. Pavement Markings – All pavement markings shall be designed, furnished and installed in accordance with current NYSDOT Standard Specifications and Standard Details, and the MUTCD, including temporary pavement markings. The Contractor shall install street parking space markings and all other street pavement markings in coordination with the local Traffic Engineer. Restriping of parking spaces shall line up with parking meters. All road pavement markings with the exclusion of decorative crosswalks shall be epoxy paint with high visibility glass beads from an approved NYSDOT source.

2.4 PERFORMANCE REQUIREMENTS

A. Epoxy reflectorized pavement markings and all other markings material shall conform to NYSDOT Standard Specification Section 685 – Epoxy Reflectorized Pavement Markings.

PART 3 - PRODUCTS

3.1 EXAMINATION

A. Verification of Conditions: Prior to installing pavement markings, verify their locations and coordinate with other construction work to verify that the pavement markings will fit without interferences.

B. Prior to beginning installation of the pavement markings, verify that all other work affecting the installation of the pavement markings is complete to the extent that the pavement markings may be installed without adversely affecting other construction.

3.2 PREPARATION

A. The Contractor shall coordinate pavement markings work in the public streets with the local Traffic Engineer. At the time of pavement marking application, all pavement surfaces and existing durable markings shall be free of oil, dirt, dust and grease.

3.3 INSTALLATION

A. Pavement markings installation and testing procedures shall conform to the requirements specified in NYSDOT Standard Specification.

B. Pavement markings shall be installed as shown on the NYSDOT standard sheets or as shown on contract documents.

C. Epoxy pavement markings shall only be placed during conditions of dry weather, and dry pavement surfaces at the width, thickness, and pattern designated by the contract documents. Following an application of glass beads, the cured epoxy marking shall be an adherent reflectorized stripe.

D. After the application and curing of pavement markings an inspection by the Engineer shall be made for film thickness, line width and glass bead coverage and retention. Any defects determined by the Engineer shall be repaired or replaced as directed by and to the satisfaction of the Engineer.

END OF SECTION

SECTION 32 31 13 - CHAIN LINK FENCE AND GATES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Contractor shall provide all labor, materials, equipment, and services necessary for, and incidental to, the installation of temporary and permanent chain link fence and gates (leaf and rolling) as shown on the Drawings and as specified herein.

1.2 RELATED SECTIONS

A. GENERAL:
1. Refer to Division 1– General Requirements.

1.3 SUBMITTALS

A. Shop Drawings: Show application to project

B. Product Data: Manufacturer's catalog cuts, with printed specifications, and installation instructions.

C. Samples: One sq. ft. minimum of 1" x 1" fence fabric and two of each size post tops and extension arms.

1.4 QUALITY ASSURANCE

A. Comply with standards of the Chain Link Fence Manufacturer's Institute.

B. Provide steel fence as a complete system produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.

C. Comply with ASTM F-1083 for requirements of Schedule 40 steel piping.

D. Height of fence shall be measured from the top of footing (concrete or crushed stone) to the top of post.

E. Posts and rails shall be continuous without splices.

F. Provide grounding as per Metro-North and National Electric Code, latest revision, requirements.

PART 2 - PRODUCTS

2.1 STEEL FRAMEWORK

A. End Posts, Corner Posts and Pull Posts:

1. Schedule 40 Steel Pipe: 2.875 inches OD, 9.11 lb. per linear ft.

B. Line Posts:
1. Schedule 40 Steel Pipe: 2.375 inches OD, 3.65 lb. per linear ft.

2.2 STEEL FABRIC

A. One-piece widths for fence heights up to 12'-0".

B. Chain link:
1. No. 9 gauge, 2 inch mesh for permanent fence.
2. No. 11 gauge, 2 inch mesh for temporary fence.

C. Selvages: Top side twisted and barbed; bottom side knuckled.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Rails and Post Braces:
1. Schedule 40 Steel Pipe: 1.660 inches OD, 2.27 lb. per linear ft.
2. Post Tops: Steel, wrought iron, or malleable iron.
3. Stretcher Bars: One piece equal to full height of fabric, minimum cross-section 3/16 inch x 3/4 inch.
4. Metal Bands (for stretcher bars): Steel, wrought iron, or malleable iron, to secure stretcher bars to end and corner.
5. Wire Ties:
6. For tying fabric to line posts, rails and braces: 9 gauge steel wire.
7. For tying fabric to tension wire: 11 gauge steel hog rings.
8. Tension Wire: 7 gauge coiled spring steel wire.
9. Angle Beams, I Beams and Steel Shapes: ASTM A-36.
10. Bolts and Nuts: ASTM A-307, Grade A.
11. Chain Link Swing Gate and Lock:
12. Swing gates double or single leaf opening as shown. Fabricate chain link swing gates in accordance with ASTM F900.
13. Chain link fabric to match specification of fence system. Fabric to be stretched tightly and secured to vertical outer frame members using tension bar and tension bands spaced 12” (304.8 mm) on center and tied to the horizontal and interior members 12” (304.8 mm) on center using 9 gauge galvanized steel ties.
14. Hinges, hot dip galvanized pressed steel or malleable iron, structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180°.
15. Latch and Lock: Galvanized forked type capable of retaining gate in closed position. Latch shall permit operation from either side of gate. The lock will be comprised of a Locinox® Gate Locks for Chain Link Gates, or approved equal. The lock shall include, a keyed gate lock and latch, security keeper and chain link holder with appropriate adapters as necessary to install chain link fabric without obstructing the use of the latch. The contractor shall provide 4 keys to MNR upon installation of lock.
16. Double gates: Provide galvanized drop rod with center gate stop pipe or receiver to secure inactive leaf in the closed position. Provide galvanized pressed steel locking latch, requiring one padlock for locking both gate leaves, accessible from either side.
17. Gate posts: Grade 1 pipe ASTM F1083 as follows:

Gate fabric height up to and including 6 ft.	
Gate leaf width:	Outside Diameter:
up to 4 ft.	2.375 in.
over 4 ft. to 10 ft.	2.875 in.
over 10 ft. to 18 ft.	4.000 in.
Gate fabric height over 6 ft. to 12 ft.	
Gate leaf width:	Outside Diameter:
up to 6 ft.	2.875 in.
over 6 ft. to 12 ft.	4.000 in.
over 12 ft. to 18 ft.	6.625 in.
over 18 ft. to 24 ft.	8.625 in.

18. Rolling Gates: Rolling/Cantilever sliding gates shall be Fortress Heavy Duty, Ameristar, AGD Systems or approved equal. Submit shop drawings for arrangement and all components.
19. Foundations for Posts:
20. 3,000 psi (28-day compressive strength) concrete for permanent fence.
21. 3/4 inch compacted crushed stone for temporary fence.

2.4 FINISHES

A. Steel Framework:
1. Pipe: Hot-dipped galvanized in accordance with ASTM F-1043, 2.0 oz. zinc per sq. ft.
2. Class “B” Steel Tubing: Exterior; 1.0 oz zinc per sq. ft. plus a coating of chromate and polyurethane. Interior; zinc rich organic coating.
3. All steel fence frameworks (i.e., line posts, end posts, corner posts, top rails and brace rails) shall be galvanized only.

B. Steel Fabric:
1. Galvanized.
2. Fence mesh as indicated on the plans.
3. Slats shall be provided as indicated on the plans or ordered by the Engineer.

C. Fence Hardware, Miscellaneous Materials, Accessories:
1. Wire Ties: Galvanized Finish, ASTM A-90 2.0 oz. zinc per sq. ft.
2. Hardware and Other Miscellaneous Items: Galvanized Finish, ASTM A-153 (Table 1).
3. Angle Beams, I Beams, and Steel Shapes: Galvanized in accordance with ASTM A-123, 2.0 oz zinc per sq. ft.
4. All hardware, miscellaneous materials and accessories for fences shall be black, thermally-fused vinyl-coated over galvanize to match fence fabric framework (except for temporary fence which shall be galvanized only).

D. Tension Wire:
1. Aluminized Finish: ASTM A-585 Class 2, 0.30 oz. per sq. ft.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate permanent fence installation with completion of finished grading including top soil and paving install.

3.2 INSTALLATION

A. Space permanent posts equidistant in the fence line with a maximum of 10 feet on center.

B. Earth: Excavate holes as per manufacturer's requirements and set posts in center of hole and fill hole with concrete or crushed stone, as applicable. Plumb and align posts. Vibrate or tamp concrete and compact crushed stone for consolidation. Finish concrete foundations in a dome shape above ground to shed water. In the case of permanent fence, do not attach fabric to posts until concrete has cured a minimum of 7 days.

C. Locate corner posts at corners and at changes in direction. Use pull posts at all abrupt changes in grade and at intervals no greater than 500 feet. On runs over 500 feet, space pull posts evenly between corner or end posts. On long curves, space pull posts so that the strain of the fence will not bend the line posts.

D. Install top rail continuously through post caps or extension arms, bending to radius for curved runs. Install expansion couplings as recommended by fencing manufacturers.

E. Install intermediate rails in one piece between posts and flush with post on fabric side using special offset fittings where necessary.

F. Diagonally brace corner posts, pull posts, and terminal posts to adjacent line posts with truss rods and turnbuckles.

G. Attach fabric to outside of fence. Maintain a 2 ½ inch clearance above top of rail or finished grade except when indicated otherwise. Thread stretcher bars through fabric using one bar for each end post and two for each corner and pull post. Pull fabric tight so that the maximum deflection of fabric is 2 inches when a 30 pound pull is exerted perpendicular to the center of a panel. Maintain tension by securing stretcher bars to posts with metal bands spaced 15 inches on center. Fasten fabric to steel framework with wire ties spaced 12 inches on center for line posts and 24 inches on center for rails and braces. Bend back wire ends to prevent injury. Tighten stretcher bar bands, wire ties, and other fasteners securely.

H. Position bolts for securing metal bands and hardware so nuts are located opposite the fabric side of fence. Tighten nuts and score excess threads.
   1. Secure post tops, extension arms, and caps with one-way cadmium plated steel screws.

I. Install ground-set items in concrete for anchorage, as recommended by fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary.

J. Tension Wire: Support bottom edge of fabric with coil spring tension wire. Weave tension wire through fabric or fasten with hog rings spaced 24 inches oc. Tie tension wire to posts with 9 gauge wire ties.

END OF SECTION

SECTION 32 31 13.53 – SECURITY FENCING

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Construction staging areas, materials lay down and other temporary facilities requiring security fencing during construction.

B. Requirements for an Underside of Platform Stair Enclosure System include:
1. Fence Panels
2. Steel Framing

1.2 RELATED SECTIONS

A. Section 01 43 00 Quality Assurance

1.3 CITED STANDARDS

A. American Society for Testing and Materials (ASTM):

1. A569 Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip, Commercial Quality

2. F626 Fence Fittings

3. F1234 Protective Coatings on Steel Framework for Fences

4. F1267 Metal, Expanded, Steel

1.4 QUALITY CONTROL:

A. Components of the fencing system, including fence panels, fittings, fasteners, and accessories, shall be products of a single manufacturer.

B. The Contractor shall be certified by the fencing system manufacturer to install its products.

1.5 SUBMITTALS:

A. Product data for each specified material.

B. Working drawings, showing the following:

1. Closure piece between adjacent structures.

C. Samples:

1. Fence panel: 12”x 12” (1” square mesh)

D. Fasteners: One of each type.

PART 2 - PRODUCTS

2.1 GENERAL:

A. The fence system shall consist of rigid, open-mesh panels and galvanized fittings, attached to galvanized steel angle frames.

B. Nominal Fence/Enclosure Dimensions: Varies (T.B.D. by manufacturer base on concrete stair dimensions, unless otherwise indicated.)

2.2 FENCE PANELS:

A. General: Fence panels shall be fabricated from carbon steel sheet, slit and simultaneously stretched into a rigid, continuous, open, diamond-shaped mesh sheet, galvanized after fabrication.

B. Sheet Steel: Carbon steel, conforming to the requirements of ASTM A569.

1. Minimum tensile strength: 62,000 psi

2. Minimum yield point, 48,000 psi

C. Galvanizing: Hot-dip, conforming to the requirements of ATM F1267 for Type I, Class II, Grade A.

D. Fence Panels: "Secura Mesh" Modified ASF 1.0-7R (#7 gage) by Alabama Metal Industries Corp. (AMICO), or equal.

1. Mesh size: 1"

2. Mesh openings: Nominal 1 ½" wide by 1 ½" high; 40% open area.

3. Mesh strand width: Nominal ¼"

4. Mesh strand thickness: Nominal 3/16"

2.3 FRAMING:

A. Materials: Galvanized steel angles,

B. Galvanizing: Hot-dip, conforming to the requirements of ASTM F1234 for Type A, Exterior

C. Angle Sizes:
1. Top and Bottom hanger: 1-1/2" x 1-1/2" x ¼"
2. Hangers (Vertical Angles): 1-1/2" x 1-1/2" x ¼"
3. Connections: Welded, Bolted, refer to structural drawings for details
4. Continuous Plate: 1-1/2" x 1/8" thick

2.4 FITTINGS:

A. General: Fittings shall be prefabricated, of heavy pressed steel or malleable iron construction, conforming to the requirements of ASTM F626, hot-dip galvanized after fabrication.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Transmit submittals and deliverables required by this Section.

B. Furnish products as indicated

C. Ensure substrates (concrete stairs) are in suitable condition to receive the Work of this Section

3.2 CLEARING:

A. Remove existing trees, stumps, shrubbery, litter; garbage and undergrowth, as necessary uninstall fencing.

B. As shown on the Contract Drawings and where necessary to perform the Work, verify all existing conditions and dimensions prior to manufacturing of fence / stair enclosures

3.3 STEEL FRAMING INSTALLATION:

A. Install steel framing as show on construction documents.

B. Vertical Hanger Spacing: Vertical framing to be evenly spaced throughout entire width of the underside of each stair. Max. distance between vertical members is to be 4 feet

3.4 FENCE PANEL INSTALLATION:

A. Provide fence panels

1. Align fence panels to infill entire frame opening.

B. Attach fence panels to steel angle framing with specified galvanized steel clips.

1. Lap fence panels over the centerline of frame section; ensure no open spaces between steel framing and fence panels.

C. Attach fence panels to steel framing with specified galvanized steel Clips.

1. Attach fence panels to framing with the cant side of the fence panel oriented in the same direction as other panels, to ensure that each succeeding panel "nests" with the previous panel.

2. Space clips/ fasteners nominally 16" apart at entire steel frame perimeter.

D. Provide vandal-resistant installation.

1. Mount fastening devices, nuts, etc., on the Railroad side of the fence, with nuts fully tightened and bolt threads pence or scar fed to prevent removal by unthreading.

3.5 TOUCH UP:

A. Touch up damaged galvanized surfaces.

END OF SECTION

SECTION 32 39 13 - MANUFACTURED METAL BOLLARDS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide and install bollards for restricting vehicular traffic from pedestrian areas and for the protection of facilities.

1.2 SUBMITTALS

A. The Contractor shall submit the following.
   1. Product Data: Provide for each type of bollard, component, finish, and accessory specified.
   2. Color Samples: Submit manufacturer’s standard colors for selection.
   3. Setting Drawings: Show embedded items and cutouts required for work specified in other Specifications.
   4. Maintenance Data: Submit manufacturer’s field touch-up, cleaning and maintenance instructions.

1.3 QUALITY ASSURANCE AND QUALIFICATIONS

A. Manufacturer Qualifications:
   1. Engage a firm which can show three (3) years of experience in the design, manufacture of steel bollards of the type required under this Section.

B. All bollards at a particular Metro-North facility shall have a similar appearance.

1.4 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:
   1. Deliver bollards and all accessories dry and undamaged, with manufacturer's protective coating intact, bearing original intact factory labels.
   2. Bollards and/or accessories which are damaged during delivery or while being unloaded shall not be stored on site. Remove such units from site and replace with new, undamaged material.

B. Storage of Materials:
   1. Store bollards and accessory materials under cover and in an area protected from dirt, damage, weather and from the construction activities. Do not store outside or allow items to become wet or soiled in any way while on site.
   2. Do not store in contact with concrete, earth or other materials that might cause corrosion, staining, scratching or damage to finish. Do not install system components which become dented, scratched or damaged in any way. Remove such components from site and replace with new, undamaged material.

C. Handling of Materials:
   1. Do not subject bollards and accessory materials to bending or stress.
   2. Do not damage edges or handle material in a manner that will cause scratches, warps or dents.

1.5 PROJECT CONDITIONS

A. Protection: Protect cast-in-place sleeves from debris and water intrusion by use of temporary covers or removable foam inserts.

1.6 Warranty

A. Provide manufacturer's standard warranty against defects in material and workmanship.
   1. Warranty Period:
      a. Five (5) years from date of invoice.
      b. Coatings: Two (2) years from date of invoice against peeling, cracking, or significant color change.

PART 2 - PRODUCTS

2.1 Bollards

A. Model: Reliance Foundry; R-1007-10, or an approved equal.

B. Size: 84 inches high x 10 ¾ inches outside diameter.

C. Finish: Reliance Foundry; Plastic Post Cover, Model R-7130, or an approved equal.

PART 3 - EXECUTION

3.1 Examination

A. Examine paving or other substrates for compliance with manufacturer's requirements for placement and location of embedded items, condition of substrate, and other conditions affecting installation of bollards.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation

A. Installation of materials provided under this Section shall be in accordance with the manufacturer's installation instructions and setting drawings.

B. Damaged, cracked, chipped, deformed or marred bollards are not acceptable. Field touch-up minor imperfections in accordance with the manufacturer's instructions.

C. Bollard foundations are to be a minimum of 4000 psi concrete 4'-6" deep with a pipe embedment of 4'-0" or as directed by the engineer.

END OF SECTION

SECTION 32 91 13 - SOIL PREPARATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The work under this section shall be subject to the requirements of the "General Conditions" governing all contract and "Special Conditions" for site work.

1.2 SCOPE OF WORK

A. The work includes all labor, materials, equipment and appurtenances for the complete execution of all work of this section as shown on the drawing, these specifications and conditions at the site, and shall include but not be limited to the following:

1. Testing off-site sources of soil, mulch, and amendment materials for approved use in turf and planting bed soil mix. Verification testing of on-site sub-soils as required.

2. Furnishing material from approved off-site sources(s) for lawn and planting soil mixes and furnishing other soil amendment materials.

3. Amending, preparing, and mixing plantings soils for turf and planting bed areas throughout the life of the contract.

4. Preparing sub-grade at turf and planting bed areas.

5. Preparation shall include amending and mixing planting soil with controlled fill material soil to the depths indicated for transition zones of each planting area.

6. Placing, spreading, and fine grading pre-mixed planting soil materials indicated for plant and seed areas.

1.3 RELATED WORK

A. Related work is described in the following sections of the specifications:

1. Section 32 01 90.26: Watering
2. Section 32 92 19: Seeding
3. Section 32 93 34: Trees

1.4 SUBMITTALS

A. Product Data: Submit to the Landscape Architect technical descriptive data for each manufactured or packaged product of this Section. Include manufacturer's product testing and analysis and installation instructions for manufactured or processed items and materials.

B. Certificates: Submit to the Landscape Architect certified analysis for each soil treatment, amendment, and fertilizer material specified and/or approved for use by the Landscape Architect. Include guaranteed analysis and weight for packaged materials.

C. Test Reports: Submit to the Landscape Architect written reports of each sample tested. Soil tests must be unique and individual to each sample taken and are not to be resubmitted or reused. Samples and analyses must be submitted within 14 calendar days of sampling. Each report shall include the following as a minimum and such other information required specific to material tested:

1. Date issued.

2. Project title and names of Contractor and material supplier.

3. Testing laboratory name, address and telephone number, and name(s), as applicable of each field and laboratory inspector.

4. Date, place, and time of sampling or test with record of temperature and weather conditions.

5. Location of material source.

6. Type(s) of test.

7. Results of tests including identification of deviations from acceptable ranges. Identify any toxic substances(s) harmful to plant growth or life.

D. Samples:

1. Leaf mold each source 5lb. packaged.

2. Soil mix 5lb. packaged.

3. Mulch material 5lb. packaged.

E. Statement(s) of Qualifications: Submit to the Landscape Architect within 15 days of notice to proceed to confirm qualifications as specified in Article 1.05 herein.

F. Quality Control Submittals:

1. Worker's Qualifications Data: Submit to the Landscape Architect the names and addresses of 5 similar projects that each person has worked on during the past 2 years.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Agricultural Chemist: Experienced person or persons employed by public or private soils testing laboratory, qualified and capable of performing tests, making soil recommendations and issuing reports as specified. Testing Laboratory and Agricultural Chemist shall be approved by the Landscape Architect.

B. References:

1. Association of Official Agricultural Chemists.

2. American Society for Testing and Materials (ASTM) using test criteria as specified or required by other references.

C. Inspections and Testing:

1. Soil, leaf mold, mulch, and other material testing required in this Section shall be furnished and paid for by the Contractor. Contractor shall provide labor to the Landscape Architect for performing any tests unless otherwise provided.

2. Owner's Representative, and/or Landscape Architect reserve the right to take and analyze at any time such additional samples of materials as deemed necessary for verification of conformance to specification requirements. Contractor shall furnish samples for this purpose upon request and shall perform testing as requested.

1.6 REGULATORY REQUIREMENTS

A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary to make Work comply with such requirements without additional cost to Owner.

B. Procure and pay for permits and licenses required for work of this section.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials to the location where soils are to be mixed, in unopened bags or containers, each bearing the name, guarantee and trademark of the producer, material composition, manufacturer's certified analysis, and the weight of the material. Retain packaging for the Landscape Architect.

B. Soil, mulch, or amendment materials stored on-site temporarily in stockpiles prior to placement shall be protected from intrusion of contaminants and erosion. Landscape Architect shall approve all temporary storage means and methods.

C. After mixing, soil materials shall be covered with a tarpaulin until time of actual use.

PART 2 - PRODUCTS

2.1 PLANTING SOIL MIXES

A. Base Component General:

1. All plant mix materials shall fulfill the requirements for new plant mixes as specified.

2. Samples of individual components of plant mixes in addition to blended plant mixes including mulch materials shall be submitted by the contractor for testing and analysis to the approved testing laboratory. Include verification testing of on-site sub-soils. Comply with specific material requirements specified.

3. No base component material for plant mix shall be used until certified test reports by an agricultural chemist have been received and approved by the Landscape Architect.

4. As necessary, make any and all soil mix amendments and resubmit test reports indicating amendments until approved.

5. Owner's Representative and/or Landscape Architect may request additional testing by Contractor for confirmation of mix quality and/or soil mix amendment at any time until completion. See Article 1.05, herein for additional requirements.

B. Base Component Material

1. Base Component Material shall be "Mark II" Dry Screened Sand 4 mm and "Outlet Soil" as supplied by East Coast Mines Ltd., Route 2 Lewis Road, Quogue, NY, 11959, or approved equal as approved by the Landscape Architect. At a minimum material must meet requirements contained in specifications for Planting Soil Mix. Base component materials, shall not be site salvaged and must be an off-site borrow material.

2. Base Components Material shall be mixed by volume with 4 Parts "Outlet Soil" to 5 Parts "Mark II" Sand. If a different soil source is used, the mix may need to be adjusted to reflect any slight variation of soils. The Landscape Architect must approve any and all modifications involving alternate sources.

3. Test Base Component Materials, both individual components and mixed materials, for compliance with material specifications. These test criteria and results, when approved shall establish the standard to which all subsequent Base Component Material tests must conform.

4. Prior to mixing Base Component Material with leaf mold, have (1) composite sample tested from each 100 c.y. of material (see each mix type for rate of testing requirement) intended for use in soil mixes of lawn and planting work.

5. Base Component Material shall meet specified requirements. The only allowable amendments to the Base Component Material will be for adjustment of nutrient levels and then only by means established by these specifications, or as per the Landscape Architect.

6. Perform the following agricultural soil tests and submit comprehensive test reports. Soil tests must be unique and individual to each sample taken and are not to be resubmitted, duplicated, or reused. Samples and analyses must be submitted within 14 calendar days of sampling. Failure to include any of the criteria stated below will be sufficient cause for rejection of the test reports.

7. Particle size analysis/distribution as defined below as well as with a hydrometer method.

8. Fertility analysis-Soil pH and soluble salts.

9. Available Nutrient analysis-Total nitrates (Nh3), phosphorus as P2O5, potassium as K20, calcium, sodium, magnesium, ammonium, iron, and manganese.

10. Cation exchange capacity.

11. Organic matter content (% ovendry weight of soil).

12. Heavy metal analysis-Selenium, chromium, cadmium, lead, nickel, cobalt, mercury, molybdenum, zinc, aluminum, boron, copper.

13. Material drainage rate.

14. Carbon/nitrogen ratio.

15. Calcium/magnesium ratio.

16. Material Requirements, "Mark II" Dry Screened Sand and 4 Parts "Outlet Soil": Material shall substantially conform to the following:

    a. Physical Analysis (Soil Texture):

	Sieve Size	% Passing	% Retained	Dimension Class
i.	1"	100.0	0.0	Gravel
ii.	¼"	99.8	1.2	Fine Gravel
iii.	#10	96.2	2.8	Very Coarse Sand
iv.	#20	82.6	11.4	Coarse Sand
v.	#40	41.1	42.5	Coarse Sand
vi.	#60	15.5	23.2	Medium Sand
vii.	#80	9.1	8.8	Fine Sand
viii.	#100	6.7	3.2	Very Fine Sand
ix.	#200	3.7	5.6	Very Fine Sand
x.	Pan		1.3	Silt/Clay

17. Chemical Analysis:

    a. Organic matter content (% oven dry weight of soil): Total content shall be 1.6-2.5%

    b. Soil reaction (pH): 4.7-6.0

18. Soluble salt content (Conductivity): 4 mmhos/cm.

19. Hydrometer Testing

    a. Gravel-3.1

    b. Sand-86.5

    c. Silt-6.0

    d. Clay-4.4

20. Material Drainage at a rate of 60% to 70% of the total volume of water within 3 minutes. Soil should be saturated prior to conducting tests.

C. Plant Mixes General:
1. All plant materials shall fulfill the requirements for new plant mixes as specified.
2. Adequate quantities of mixed planting soil materials shall be provided to attain, after compaction and natural settlement all design finish grades. Verify quantities for placement to suit conditions.

3. Mixing of Amendments: Add leaf mold in proportions as specified and as confirmed by testing. Other amendments shall not be added unless approved to extent and quantity by Landscape Architect and additional tests have been conducted to verify type and quantity of amendment is acceptable.

D. Testing of Plant Mixes:

1. Perform initial tests to confirm compliance with mix specifications. These test results, when approved, will establish the standard to which all other tests results must conform.

2. Follow-up Testing: Have one (1) composite sample tested prior to delivery and upon arrival to the job site for each 100 c.y. of material (see each mix type for rate of testing requirement) or as required by the Landscape Architect intended for use in each type of turf area and plant mix to include the following:

3. Particle size analysis: Use sieve sizes as specified for Base Component Material.

4. Composition Analysis: Use the hydrometer method and classify the soil.

5. Nutrient Analysis:

a. Have available nutrient levels (nitrate nitrogen, water soluble nitrogen, phosphorous as P205, potassium as K20, magnesium, calcium, ammonium, iron, and manganese) tested, and request testing laboratory recommendations for additional fertilizer requirements at both lawn and all plant areas if nutrient levels are below average.

b. Available nutrient deficiencies in soil mixes for plant beds shall be corrected with amendment materials prior to installation, and shall be monitored throughout up until and including the landscape planting installation period. Deficiencies confirmed by testing shall also be corrected during the maintenance period specified.

c. Available nutrient deficiencies in soils of lawn areas shall be corrected with amendment materials both prior to time of lawn installation and during maintenance period as specified.

6. Test organic matter, pH, cation exchange capacity, carbon/nitrogen ratio, calcium/magnesium ratio and material drainage rate.

E. Soil Mix Types: Provide the following planting soil mix types at the locations indicated. Percentages of components, unless-otherwise noted will be established upon completion of individual test results for components of the various mixes. The controlling factor will be the percent (0/c) organic matter as specified for each mix. Note that percent (%) by volume of components will be in large part, determined by the leaf mold and amendment materials. Specifically the bulk density reading of the leaf mold will directly impact the organic matter readings which have been specified for each mix.

1. Topsoil Mixture for Turf Restoration: Soil Mix 'A'

2. Organic Matter: 6-8%.

3. Base Component Materials: 60-70% by volume (Exact percent to be identified through testing as previously specified).

4. Leaf mold: 30-40% by volume (Exact percent to be identified through testing as previously specified).

5. Soil pH to be 6.5-7.0.

6. Available nutrients (Nitrates/ Phosphate/ Potassium) to be Nitrates: 30-100 ppm, Phosphate: 5-25 ppm, Potassium: 15-40 ppm.

7. Soluble salts no higher than 50.0 mmhos/cm min.

8. Other amendments as indicated by test results and as directed by Landscape Architect.

9. Topsoil Mixture for Planting Beds: Soil Mix 'B'
    i. Organic Matter: 12-15%.
    ii. Base Component Materials: 30-50% (Exact percent to be identified through testing as previously specified.
    iii. Leaf mold: 50-70% (Exact percent to be identified through testing as previously specified).
    iv. Soil pH to be 6.5-7.0.
    v. Available nutrients (Nitrate/ Phosphate/ Potassium) to be Nitrates: 30-100 ppm, Phosphate: 5-25 ppm, Potassium: 15-40 ppm.
    vi. Soluble Salts no higher than 50.0 mmhos/cm min.
    vii. Other amendments as required by test results and as directed by Landscape Architect.

2.2 SOIL AMENDMENT MATERIAL

A. Leaf Mold (Fully Composted)

1. Leaf Mold: Shredded leaf litter, composted for a minimum of one year (12 months) and tested to confirm the following characteristics:

2. The leaf mold must be free of all inorganic debris such as plastic fragments, glass and metal fragments.

3. The leaf mold must be free of any and all stones larger than ½", large branches, and large roots over ½" in length. 100% of leaf mold must pass a ½" screen.

4. Chemical Analysis:

   a. Organic matter content (% ovendry weight of soil): Total content shall be within a range of 45-70% (% ovendried weight of leaf mold).

   b. Soil reaction (pH) measured as a 1:5 dilute in the range from 6.5-7.5.

   c. The carbon/nitrogen ratio should fall between 12:1 and 25:1.

   d. The calcium/magnesium ratio should fall between 2:1 and 6:1.

   e. The soluble salt content (conductivity) must be less than 150 mmhos/cm for a 1:5 leaf mold to water ratio.

   f. A fertility analysis (nitrate, phosphate, potassium, calcium, and magnesium levels) must be provided for each batch of leaf mold.

5. Material Drainage: at a rate of 55% to 70% of the total volume of water within 3 minutes. Soil should be saturated prior to conducting test.

6. The leaf mold shall be tested for nutrient content as specified below. Trace nutrient content shall fall within the range of the following indicated amounts:

	Element	Acetate Extract	HCL Extract
a.			
b.	Iron	0.5-5.0 ppm	greater than or equal to 5 ppm
c.	Manganese	0.5-8.0 ppm	less than or equal to 15.4 pp
d.	Molybdenum	0.5-1.0 ppm	greater than or equal to 1.0 ppm
e.	Zinc	0.1-1.0 ppm	greater than or equal to 4.4 ppm
f.	Aluminum	0.1-2.0ppm	greater than or equal to 2.0 ppm
g.	Boron	0.1-1.0 ppm	greater than or equal to 1.7 ppm
h.	Copper	0.1-1.0ppm	greater than or equal to 1.0 ppm

7. The leaf mold shall be tested for toxic substance content as specified below. Heavy metal content not to exceed (less than) the following indicated amounts:

	Element	Acetate Extract	HCL Extract
a.			
b.	Lead	less than or equal to 0.1 ppm	less than or equal to 25 ppm
c.	Selenium	less than or equal to 0.1 ppm	less than or equal to 10 ppm
d.	Mercury	None	None
e.	Chromium	less than or equal to 0.1 ppm	less than or equal to 1 ppm
f.	Cadmium	less than or equal to 0.5 ppm	less than or equal to 0.2 ppm
g.	Nickel	less than or equal to 0.5 ppm	less than or equal to 2 ppm
h.	Cobalt	less than or equal to 0.5 ppm	less than or equal to 2 ppm

   i. None = none detected = below detection limits of 0.01 ppm

8. Rate of testing for Leaf Mold: Have one (1) composite sample tested for each new source of supply, each variable pile within each source of supply, and/or for each 50 c.y. of material or as directed by the Landscape Architect.

9. Ground Limestone: Ground Limestone as a soil amendment material will only be used pending results of analysis.

10. Provide a dolomitic limestone with a minimum of 88% of calcium and magnesium carbonates.

11. Ground limestone material shall have a total of 100% passing the 1-mesh sieve, minimum of 90% passing the 20-mesh sieve, and a minimum of 60% passing the 100-mesh sieve.

B. Common Fertilizers

1. Fertilizers (For amending Soil Mixes): Provide to extent approved by Landscape Architect as a result of soil test recommendations for each plant condition.

a. "Dry Roots 2 Formula" For Planting and Turf (3-3-3) as manufactured by Roots Inc. 3120 Weatherford Road, Independence, MO 64055.

b. Multi Purpose Fertilizer for Trees, Plants and Turf (10-10-10) as manufactured by Lebanon Lawn & Garden, 1600 East Cumberland Street, Lebanon, PA 17402.

c. Or approved equal, as approved by Landscape Architect.

C. Compost Material

1. Biosolid material (For amending Soil Mixes): Provide to extent approved by Landscape Architect, as a result of agricultural soil testing for available nutrients required for each plant condition.

a. "Nutri-Brew" as distributed by Commodities Specialties, P.O. Box 610, Baldwinsville, NY 13027, Phone (315)638-1113.

b. "Orgrow" as provided by the Professional Services Group Inc. 300 Anthony Street Schenectady, NY 12308, Phone (518)382-5025.

c. "EarthMate" as provided by the Philadelphia Water Department Biosolids Management Unit, 4th floor, ARAMARK Tower, 1101 Market Street, Philadelphia, Pennsylvania 19107-2994, Phone (215)685-6248, Fax (215)685-6207.

2. "Allgro" as produced by Synagro Technologies, 1800 Bering Drive, Suite 1000, Houston, TX 77057, Phone (800) 370-0035.

3. Or approved equal, as approved by Landscape Architect.

D. Herbicides: For possible use if there is seed germination on-site after sub-grade placement prior to planting mix installation or after subsequent plant mix installation. Under no circumstance are materials to be applied without specific instruction from the Landscape Architect.

1. Herbicides shall be approved before use for type and rate of application by the owner and by local and state agencies with jurisdiction.

2. Emergent shall be “Roundup”, as manufactured by Monsanto Agricultural Products Company, C3NJ, St. Louis, MO 63166, or an approved equal as approved by Landscape Architect.

2.3 MULCH MATERIALS

A. Organic Mulch

1. Double hammered hardwood bark and/or leaf mold mixture for ground cover, annual, perennial beds and tree and shrub saucers and/or beds from the following sources:

a. “Peanut Hulls & Milled Leaf” mulch by Brookside Nurseries Inc. 228 Brookside Road, Darien, CT 06820, (203) 655-3978.

b. “Southland Soil Conditioner” mulch as provided by Southern Importers Inc. P.O. Box 8579, Greensboro, NC 27419, (919) 292-4521.

c. Or approved equal, as approved by Landscape Architect.

B. Mulch materials shall have been composted for a minimum of 6 months and tested to confirm the following characteristics:

1. The mulch materials must be free of all inorganic debris such as plastic fragments, glass, and metal fragments.

2. The mulch material must be free of stones larger than ¼”, branches, and large roots over ½” in length.

3. Wood chips over ½” in length or diameter should be removed by screening.

4. Chemical Analysis:

a. Organic matter content (% ovendry weight of mulch): Total content shall be 60-90%.

b. Soil reaction (pH) measured as a 1:5 dilute in the range from: 4.5-6.0 at time of supply. Amend pH with dolomitic limestone to bring mulch pH to 6.0-7.0 at time of installation.

c. The carbon/nitrogen ratio should fall between 2:1 and 6:1.

d. The calcium/magnesium ratio should fall between 2:1 and 6:1.

5. Heavy metal content not to exceed (less than) the following indicated amounts:

	Element	Acetate Extract	HCL Extract
b.	Iron	0.5 ppm	3.1 ppm
c.	Manganese	0.5 ppm	15.4 ppm
d.	Molybdenum	0.4 ppm	0.8 ppm
e.	Zinc	0.2 ppm	4.4 ppm
f.	Aluminum	0.2 ppm	1.2 ppm

g.	Boron	1.1 ppm	1.7 ppm
h.	Copper	None	0.01 ppm
i.	Lead	0.1 ppm	0.4 ppm
j.	Selenium	None	0.4 ppm
k.	Mercury	None	None
l.	Chromium	None	None
m.	Cadmium	None	0.02 ppm
n.	Nickel	None	0.04 ppm
o.	Cobalt	None	0.05 ppm

p. None = none detected = below detection limits of 0.01 ppm.

C. Test mulch material

1. Rate of Testing for Mulch Material: Have one (1) composite sample tested for each new source of supply, each variable pile within each source of supply, and/or for each 35 c.y. of material or as directed by the Landscape Architect.

2. In mock-up installation with Soil Mix 'B' (8 parts Soil Mix 'B' to 2 parts proposed Mulch Material) to ensure compliance with material specifications including organic matter, pH, and heavy metal content. Use parameters for Soil Mix 'B' as standard for testing. Have one (1) composite sample tested for each new source of supply, each variable pile within each source of supply, and each 50 c.y. of material or as directed by the Landscape Architect.

PART 3 - EXECUTION

3.1 VERIFICATIONS

A. Prior to construction and soil placement operations at planting and turf areas, ascertain the location of all existing and proposed electric, cable, conduits, under-drainage systems and utility lines. Take proper precautions so as not to disturb or damage sub-surface elements. Contractor failing to take these precautions shall be responsible for making requisite repairs to damaged utilities at Contractor's own expense.

B. Verify that required underground utilities are available in proper location, and ready for use. Coordinate with others.

C. Verify that all work requiring access through or adjacent to areas where plant mixes are to be placed has been completed and no further access (other than Landscape installation) will be required. In the event that access will be required, this must be coordinated with the Landscape Architect.

3.2 PREPARATION OF SUB-GRADE

A. Prior to dumping and spreading soils, the Contractor shall furnish and install grade stakes on a 25-foot grid in open areas and sufficiently spaced in other areas to ensure correct line and grade of sub-grade and finished grade. Grade stakes shall be approved by the Landscape Architect prior to soil placement.

B. All amendments shall be thoroughly incorporated into the mixture to assure uniform distribution. Delay mixing of compost and/or fertilizers if planting will not follow within 48 hours.

C. Additional amendments shall be mixed into the soil as confirmed by the testing reports and as approved by the Landscape Architect for each plant type and condition of installation.

3.3 PLACING PLANTING SOIL

A. Remove all large clods, lumps, brush, roots, stumps, litter, and other foreign material and stones one-half inch (1/2") in diameter or larger. Legally dispose of removed material off site.

B. Do not place a muddy or wet soil mix.

C. Existing Soil Conditions: Prior to placing soil, scarify or otherwise loosen 3-inches of the surface of the sub-grade to ensure proper blending of the sub-grade to new soil materials.

D. Place and spread planting soil mix of the type specified over approved sub-grade to a depth sufficiently greater than the depth required for lawn, woodland, and planting areas so that after natural settlement, misting and/or light rolling, as previously approved by the Landscape Architect, the completed work will conform to the lines, grades, and elevations shown or otherwise indicated.

E. Turf Restoration: Soil Mix 'A' (See Section 2.1-D-1 for Soil Mix 'A')

1. Required Soil Mix 'A' depth shall be as indicated on drawings with a minimum of six inches (6") measured after completion of final grading.

2. Place fills lightly in layers of three-inch (3") lifts and settle to eliminate air pockets and minimize settlement. Lightly scarify previously placed surfaces prior to placing subsequent lifts. Fills shall not be so compacted as to restrict the flow of air or water through the soil as previously specified.

3. Roll the whole surface of lawn bed with a hand roller weighing approximately one hundred (100 lb) per foot (12") of roller width. During the rolling, fill all depressions caused by settlement with additional planting soil and then re-grade and add 1" leaf mold to surface as shown on drawings. Lightly roll and rake until the surface presents a smooth, even, and uniform finish that is at required grade.

4. Allow plant mix in turf areas to remain undisturbed until fully settled in accordance with settlement methodology submitted as approved by Landscape Architect. After any additional settlement has occurred, restore areas to finished grade prior to seeding.

5. Protect plant mix against construction activity with Construction Limit Fencing and from the eroding effects of wind and rain with filter fabric as approved for the protection plan.

F. Planting Beds: Soil Mix 'B' (See Section 2.1-D-2 for Soil Mix 'B')

G. Required Soil Mix 'B' depths shall be as indicated on drawings with a total planting depth to be a minimum of twenty-four inches (24") as measured in place in a settled position.

H. Place fills lightly in layers of maximum of twelve-inch (12") lifts and very carefully settle soils to eliminate air pockets and to minimize future settling. Lightly scarify previously placed surfaces prior to placing subsequent lifts. The Landscape Architect shall, as previously, approve proposed method of settlement. Method may include, but is not limited to, natural settlement over an approved period of time or light hand tamping and light water misting of each layer.

I. After natural settlement has occurred, add soil to maintain finished grades. If for any reason soil is left exposed for a long duration prior to planting, add soil and regrade as required. Fills shall not be so compacted as to in any way restrict the flow of water or air through the soil.

J. Protect plant mix against construction activity with Construction Limit Fencing and from the eroding effects of wind and rain with filter fabric as approved for the protection plan.

K. Grading Tolerances: Turf, planting, and planting bed areas shall be fine graded within plus or minus (0.10) feet of grades indicated on drawings. Maintain all "flat" areas and slopes to allow free flow of surface drainage without ponding.

END OF SECTION

SECTION 32 91 13.16 - MULCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The applicable provisions of Division 1 shall apply to this Section.

DESCRIPTION

B. This work shall consist of applying mulch in accordance with the plans, specifications and direction of the ISA Certified Arborist or the Landscape Architect.

1.2 SUBMITTAL

A. Workers Qualifications: Submit to the ISA Certified Arborist or Landscape Architect the names and addresses of 5 similar projects that each person has worked on during the past 2 years.

B. Mulch Sample: A five (5) pound bag of Organic mulch: Double hammered hardwood bark and/or leaf mold mixture for ground cover, annual, perennial beds and tree and shrub saucers and/or beds from the following sources:

1. "Peanut Hulls & Milled Leaf" mulch by Brookside Nurseries Inc. 228 Brookside Road, Darien, CT 06820, (203) 655-3978.
2. "Southland Soil Conditioner" mulch as provided by Southern Importers Inc. P.O. Box 8579, Greensboro, NC 27419, (919) 292-4521.
3. Or approved equal, as approved by the ISA Certified Arborist or Landscape Architect.

C. Mulch Analysis: See 2.1 Material C.

1.3 RELATED WORK

A. Related work is described in the following sections of the specifications:

1. Section 32 01 90.26: Watering

1.4 REGULATORY REQUIREMENTS

A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary to make Work comply with such requirements without additional cost to Owner.

B. Procure and pay for permits and licenses required for work of this section.

C. Mulch materials stored on-site temporarily in stockpiles prior to placement shall be protected from intrusion of contaminants and erosion. ISA Certified Arborist or Landscape Architect shall approve all temporary storage means and methods.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Mulch: Double hammered hardwood bark and/or leaf mold mixture for ground cover, annual, perennial beds and tree and shrub saucers and/or beds from the following sources:

1. "Peanut Hulls & Milled Leaf" mulch by Brookside Nurseries Inc. 228 Brookside Road, Darien, CT 06820, (203) 655-3978.

2. "Southland Soil Conditioner" mulch as provided by Southern Importers Inc. P.O. Box 8579, Greensboro, NC 27419, (919) 292-4521.

3. "Double Hammered" mulch as provided by All Island Mason Supply 180 Townline Road, Kings Park, NY 11754, (631) 266-3600

B. Mulch materials shall have been composted for a minimum of 6 months and tested to confirm the following characteristics:

1. The mulch materials must be free of all inorganic debris such as plastic fragments, glass, and metal fragments.

2. The mulch material must be free of stones larger than ¼", branches, and large roots over ½" in length.

3. Wood chips over ½" in length or diameter should be removed by screening.

4. Chemical Analysis:

a. Organic matter content (% oven dry weight of mulch): Total content shall be 60-90%.

b. Soil reaction (pH) measured as a 1:5 dilute in the range from: 4.5-6.0 at time of supply. Amend pH with dolomitic limestone to bring mulch pH to 6.0-7.0 at time of installation.

c. The carbon/nitrogen ratio should fall between 2:1 and 6:1.

d. The calcium/magnesium ratio should fall between 2:1 and 6:1.

5. Heavy metal content not to exceed (less than) the following indicated amounts:

	Element	Acetate Extract	HCL Extract
a.			
b.	Iron	0.5 ppm	3.1 ppm
c.	Manganese	0.5 ppm	15.4 ppm
d.	Molybdenum	0.4 ppm	0.8 ppm
e.	Zinc	0.2 ppm	4.4 ppm
f.	Aluminum	0.2 ppm	1.2 ppm
g.	Boron	1.1 ppm	1.7 ppm
h.	Copper	None	0.01 ppm
i.	Lead	0.1 ppm	0.4 ppm

j.	Selenium	None	0.4 ppm
k.	Mercury	None	None
l.	Chromium	None	None
m.	Cadmium	None	0.02 ppm
n.	Nickel	None	0.04 ppm
o.	Cobalt	None	0.05 ppm

6. None = none detected = below detection limits of 0.01 ppm.

2.2 Test mulch material

A. Rate of Testing for Mulch Material: Have one (1) composite sample tested for each new source of supply, each variable pile within each source of supply, and/or for each 35 c.y. of material or as directed by the ISA Certified Arborist or Landscape Architect.

PART 3 - EXECUTION

3.1 PREPARATION

A. Apply Mulch for all backfilled surfaces of pits, trenches, planted areas, and other areas indicated.

3.2 METHOD

A. Applying Mulch:

B. Spread mulch over finished surface of each tree pit in the following amounts:

C. Trees and Shrubs: Double Hammered Hardwood Bark: 2 inches

D. Mulch shall not be applied within 3 inches of Plant stem(s).

E. Mulch shall not cover plants or be in contact with tree root flare or tree trunks.

F. Mulch shall be distributed so as to create a smooth, level cover over the exposed soil.

G. Water trees thoroughly after mulching.

END OF SECTION

SECTION 32 91 13.19 - PLANTING SOIL MIX

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The applicable provisions of Division 1 shall apply to this Section.\

1.2 DESCRIPTION

A. This work shall consist of applying planting soil mix in accordance with the plans, specifications and direction of the ISA Certified Arborist and the Landscape Architect.

1.3 SUBMITTAL

A. Workers Qualifications: Installation and maintenance foreman on the job shall be competent English-speaking supervisor(s) experienced in landscape installation and maintenance. Perform work with personnel totally familiar with planting soil preparation and lawn and planting installations under the supervision of a foreman experienced with landscape work.

B. Test Reports: Submit to the Landscape Architect written reports of sample tested. Samples and analyses must be submitted within 14 calendar days of sampling. Each report shall include the following as a minimum and such other information required specific to material tested:

1. Date issued.

2. Project title and names of Contractor and material supplier.

3. Testing laboratory name, address and telephone number, and name(s), as applicable of each field and laboratory inspector.

4. Date, place, and time of sampling or test with record of temperature and weather conditions.

5. Location of material source.

6. Results of tests including identification of deviations from acceptable ranges. Identify any toxic substances(s) harmful to plant growth or life.

C. Soil Sample: A five (5) pound bag of planting soil mix.

1.4 RELATED WORK

A. Related work is described in the following sections of the specifications:

1. Section 32 01 90.26: Watering

1.5 REFERENCES

A. Perform all required work in accordance with the applicable rules and regulations and the Codes and Ordinances of Local, State and Federal Authorities.

B. All work and material shall comply with the provisions of Sections 2.26 and 4.15 of the NYCDOT Highway Specifications.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Planting Soil Mix: All plant mix materials shall fulfill the requirements for new plant mixes as specified.

B. Samples of individual components of plant mixes in addition to blended plant mixes including mulch materials shall be submitted by the contractor for testing and analysis to the approved testing laboratory. Include verification testing of on-site sub-soils. Comply with specific material requirements specified.

C. No base component material for plant mix shall be used until certified test reports by an agricultural chemist have been received and approved by the ISA Certified Arborist and the Landscape Architect.

D. As necessary, make any and all soil mix amendments and resubmit test reports indicating amendments until approved.

E. Adequate quantities of mixed planting soil materials shall be provided to attain, after compaction and natural settlement all design finish grades. Verify quantities for placement to suit conditions.

F. Uniformly mix ingredients as specified for each Mix Type (Base Component Material leaf mold, and other ingredients deemed to be necessary as a result of testing) by wind rowing/tilling on an approved hard surface area. Organic matter shall be maintained moist, not wet during mixing.

G. Mixing of Amendments: Add leaf mold in proportions as specified and as confirmed by testing. Other amendments shall not be added unless approved to extent and quantity by Landscape Architect and additional tests have been conducted to verify type and quantity of amendment is acceptable.

H. Testing of Plant Mixes:

1. Perform initial tests to confirm compliance with base material and mix specifications. These test results, when approved, will establish the standard to which all other tests results must conform.

2. Follow-up Testing: Have one (1) composite sample tested prior to delivery and upon arrival to the job site for each 100 c.y. of material (see each mix type for rate of testing requirement) or as required by Owner's Representative intended for use in each type of turf area and plant mix to include the following:

a. Particle size analysis: Use sieve sizes as specified for Base Component Material.
b. Composition Analysis: Use the hydrometer method and classify the soil.
c. Nutrient Analysis:

i. Have available nutrient levels (nitrate nitrogen, water soluble nitrogen, phosphorous as P205, potassium as K20, magnesium, calcium, ammonium, iron, and manganese) tested, and request testing laboratory recommendations for additional fertilizer requirements at both lawn and all plant areas if nutrient levels are below average.

ii. Available nutrient deficiencies in soil mixes for plant beds shall be corrected with amendment materials prior to installation, and shall be monitored throughout up until and including the landscape planting installation period. Deficiencies confirmed by testing shall also be corrected during the maintenance period specified.

iii. Available nutrient deficiencies in soils of lawn areas shall be corrected with amendment materials both prior to time of lawn installation and during maintenance period as specified.

d. Test organic matter, pH: cation exchange capacity, carbon/nitrogen ratio, calcium/magnesium ratio and material drainage rate.

e. Soil Mix Types: Provide the following planting soil mix types at the locations indicated. Percentages of components, unless-otherwise noted will be established upon completion of individual test results for components of the various mixes. The controlling factor will be the percent (0/c) organic matter as specified for each mix. Note that percent (%) by volume of components will be in large part, determined by the leaf mold and amendment materials. Specifically, the bulk density reading of the leaf mold will directly impact the organic matter readings which have been specified for each mix.

i. Topsoil Mixture for Planting Beds: Soil Mix 'B'
   I. Organic Matter: 12-15%
   II. Base Component Materials: 30-50% (Exact percent to be identified through testing as previously specified).
   III. Leaf mold: 50-70% (Exact percent to be identified through testing as previously specified).
   IV. Soil pH to be 6.5-7.0.
   V. Available nutrients (Nitrate / Phosphate/Potassium) to be Nitrates: 30-100 ppm, Phosphate: 5-25 ppm, Potassium 15-40 ppm.
   VI. Soluble Salts no higher than 50.0 millmhos/cm min.
   VII. Other Amendments as required by test results and as directed by Landscape Architect.

3. Stockpiling

a. General: Stockpiling on-site, off-site and at source should be restricted to no more than the needs of what can be used in a 24-hour period. Under no circumstances

shall on-site or off-site stored material exceed 50 c.y. Stockpiles should be no more than 6 feet in height to prevent anaerobic conditions within the pile(s) of Stockpiles shall be sheltered from weather to prevent excessive water absorption and blowing by winds as approved by the ISA Certified Arborist and the Landscape Architect.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove any debris, concrete, asphalt, rocks, or other non-soil material in the work area.

B. Amended soil shall consist of approved organic material and acceptable existing excavated soil mixed on site in the proportion of one (1) part organic material to two (2) parts existing soil. If no acceptable soil is found, contractor shall supply topsoil to replace the existing excavated soil.

C. Superphosphate (fertilizer type No. 9) shall be evenly distributed throughout all tree and shrub pits and planting beds at the following rates: 1.6 oz / major tree, 1.2 oz / minor tree, and .8 oz / square foot of planting bed.

3.2 METHOD

A. Applying Planting Soil Mix:

1. Planting areas shall be fine graded within plus or minus (0.10) feet of grades indicated on drawings. Maintain all “flat” areas and slopes to allow free flow of surface drainage without ponding.

END OF SECTION

SECTION 32 92 19 - SEEDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contract Drawings and other Contract Documents, including the General Conditions, Supplementary Conditions, and Division 01 Specification Sections, apply to the Work of this Section.

B. Related Sections include the following:
   1. Section 01 33 00 - Submittal Procedures.
   2. Section 01 50 00 - Temporary Facilities and Controls.
   3. Section 01 74 00 - Cleaning and Waste Management.

1.2 SUMMARY

A. This Section specifies requirements for adding soil supplements to the topsoil, lawn seeding, and mulching.

1.3 REFERENCES

A. Reference Standards:
   1. Association of Analytical Communities International (AOAC):
      a. AOAC Official Methods of Analysis of AOAC International.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Scheduling:
   1. Environmental Requirements:
      a. The following seasonal constraints govern when the Work of this Section can be performed, except that when environmental conditions warrant, the Engineer may extend the specified dates.
         i. Allowable Seeding Dates:
            a) Spring: March l to June l.
            b) Fall: August l to October l.
            c) Do not seed Crown vetch between September 1 and October 31, inclusive.
      b. Do not perform the Work of this Section when soil or weather conditions are unsuitable.
         i. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation of any kind present or occurring during the Work.
         ii. Sow seed mixtures when the air current is slow so that the mixture seeds the intended area and is not dispersed elsewhere.

c. Do not seed Crown vetch when the ambient temperature is below 32 degrees Fahrenheit.

2. Seeding Schedule:
   a. Prepare a proposed seeding schedule that indicates the dates for performing each type of landscape work in various areas of the Site during normal seasons for such work.
      i. Submit the proposed seeding schedule to the Engineer for approval.
         a) Once accepted, only revise schedule dates as approved in writing by the Engineer, and after submitting documentation of the reasons for the changes.
   b. Proceed with, and complete landscape work as rapidly as portions of the Site become available, working within seasonal limitations for each kind of landscape work required.
      i. Seed or apply materials during the normal seasons for each type of material required.
   c. Correlate the seeding schedule with specified maintenance periods to provide maintenance from the date of Substantial Completion.

1.5 QUALITY ASSURANCE

A. Certifications:
   1. Analysis and Standards:
      a. For standard products, include the manufacturer's certified analysis of the contents with each package.
      b. For other materials, provide analysis of the contents by a recognized laboratory performed in accordance with methods established in the AOAC Official Methods of Analysis of AOAC International, wherever applicable.
   2. Seed Certificates of Compliance:
      a. Have the lawn seed mixture Supplier prepare certificates or certifying tags indicating that the lawn seed mixtures, seed purity percentages, seed germination percentage, and weed seed content percentages are in conformance with the requirements specified.
      b. Submit certificates or certifying tags for lawn seed mixtures to the Engineer for approval.

1.6 SUBMITTALS

A. Action Submittals:
   1. Submit the following to the Engineer for approval.
      a. Certificates:
         i. Seed Certificates of Compliance.
      b. Delegated Design Submittals:
         i. Seeding Schedule.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:

1. Ship new crop seed in sealed packages with proof that the correct mixture is enclosed, with the age indicated, and with certification that the material complies with applicable State regulations if required.
2. Deliver packaged materials to the Site as originally packaged in unopened containers with labels intact and legible showing the weight, analysis, and name of its manufacturer.

B. Storage and Handling Requirements:
1. Store packaged products such that moisture damage and other forms of contamination are prevented.

C. Packaging Waste Management:
1. Comply with the approved Waste Management Plan required in Section 01 74 00, Cleaning and Waste Management.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Crown Vetch Seed Inoculation:
1. Provide a pure culture of nitrogen-fixing bacteria selected for maximum vitality and ability to transform nitrogen from the air into soluble nitrates.
2. Maintain temperatures of inoculant in strict compliance with the manufacturer's requirements.

B. Grass Seed:
1. Provide new crop seed, furnished in sealed packages evidencing proof that the correct mixture is enclosed, indicating the age of the seed, and showing compliance with applicable State regulations, if required.

C. Mulching Material:
1. Lawn Mulch:
a. Provide lawn mulch.

2. Mulch Binder:
a. Provide mulch binder.

D. Soil Supplements:
1. Provide soil supplements.

2.2 MIXES

A. Provide seed mixtures as indicated in Schedule 32 92 19-1, Schedule 32 92 19-2, Schedule 32 92 19-3, Schedule 32 92 19-4, Schedule 32 92 19-5, and Schedule 32 92 19-6 located at the end of this Section.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Pre-Installation Testing:
   1. Topsoil Testing:
      a. The topsoil for lawn areas must be tested.

B. Evaluation and Assessment:
   1. Soil Supplement Recommendations for Lawn Areas:
      a. The laboratory test reports for the topsoil testing performed will recommend soil supplements for the topsoil used for lawn areas.

3.2 PREPARATION

A. Surface Preparation:
   1. Tillage:
      a. Till finish graded soil over the areas indicated to be lawn regardless of the type of lawn work to be performed.
         i. Use equipment and methods common to such work, and till the soil to a minimum depth of 2 inches.
   2. Soil Supplements for Lawn Areas:
      a. Recommendations will be provided for both the grade and application rates of fertilizer and other soil supplements required to be added to the topsoil available for the Contract, whether new or existing at the Site.
      b. Add the recommended soil supplements to the topsoil for lawn areas according to the approved recommendations included with laboratory test reports for the topsoil.
         i. These soil supplements may be incorporated into the soil during tillage operations.

3.3 APPLICATION

A. Equipment
   1. Lawn Roller:
      a. Furnish a cultipacker or similarly designed lawn roller weighing 60 to 90 pounds per linear foot of roller.
   2. Watering Equipment:
      a. Furnish hoses and other watering equipment required to perform the Work of this Section.

B. Seeding:
   1. Not more than 5 days after soil supplements have been applied in areas disturbed by construction, sow seed mixtures in accordance with the following:
      a. For standard lawns, provide a grass mixture in accordance with the requirements of Schedule 32 92 19-1.

b. For areas that are not maintained and having slopes steeper than 3 horizontal to 1 vertical, provide a grass mixture in accordance with the requirements of Schedule 32 92 19-2.
c. For areas that are not maintained, meaning that are not mowed, provide a grass mixture in accordance with the requirements of Schedule 32 92 19-3.
d. For temporary grass, provide a grass mixture per Schedule 32 92 19-4.
e. For low maintenance grass, provide a grass mixture in accordance with the requirements of Schedule 32 92 19-5.
f. For areas in wetland areas that are not maintained, provide a grass mixture in accordance with the requirements of Schedule 32 92 19-6.

2. Sow the seeds over the areas indicated in 2 applications using mechanical power seeders, mechanical hand seeders, or the hydroseeding method.
   a. If the hydroseeding method is used, both seeding and soil supplement may be applied together; however, the rates of application, methods, and equipment must be approved by the Engineer prior to using this method.
3. Sow one-half of the seed mixtures in one direction over the designated areas and the remainder at right angles to the first sowing.
4. Sow seeds at the following rates:
   a. Grass Seed Mixture: At rates specified in the seed schedules.
   b. Crown vetch Mixture:
      i. Crown vetch: 4 pounds per 1,000 square yards.
      ii. Ryegrass: 5 pounds per 1,000 square yards.

C. Seed Cover:
1. Embed seed mixtures 1/4-inch into the topsoil using a light drag or rake moving in directions parallel to the contour lines.
2. Immediately after dragging or raking, compact the seeded areas using a lawn roller.
   a. Roll the seeded areas at right angles to existing slopes.

D. Crown vetch Seed Inoculation:
1. Perform the inoculation process as recommended by the seed supplier subject to the Engineer’s approval.
   a. Deposit the seed inoculation into the soil.
   b. Maintain the temperature of the inoculants in strict compliance with the manufacturer's requirements.

E. Lawn Mulching:
1. Not more than 48 hours after seeding, evenly apply lawn mulch over seeded areas.
   a. Start mulching at the windward side of relatively flat areas, or at the upper part of slopes.
   b. Spread mulch to provide total coverage to a depth not less than 1-1/2 inches or more than 3 inches.
2. Immediately after spreading the mulch, either apply mulch binder to anchor the mulch to the soil or secure the mulch by the peg and string method.
   a. To apply mulch binder, make up to three passes over the mulch as needed to firmly secure the mulch.
      i. Apply up to 10 gallons of binder per 1,000 square feet of seeded area.
   b. To secure the mulch by the peg and string method, drive stakes into the ground on 3-foot centers or less, and string binder twine in straight lines between adjacent stakes but diagonally crisscrossed over the mulch.

i. After the twine is attached, drive the stakes nearly flush to the ground to draw the twine down and tight onto mulch.

3.4 REPAIR/RESTORATION

A. Reseed areas not promptly showing that the grass has caught and exhibits healthy grass growth.
   1. Correct depressions and irregularities and reseed the area.
   2. Repeat correcting and reseeding until a complete coverage with grass is obtained.

B. Should washouts and bare spots result from inadequate protection or otherwise, repair and reseed these areas as required until a healthy, complete coverage stand of grass is obtained.

C. Make repairs and replacements as required by the Engineer at no increase in the Contract Price.

3.5 SITE QUALITY CONTROL

A. Site Inspections:
   1. Any commercial fertilizer that becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.
   2. At the conclusion of maintenance periods, the Engineer will inspect seeding work to determine if its condition is acceptable, or if repairs are required.

3.6 PROTECTION

A. Protect seeded areas from washouts by using the methods specified in this Section and in Section 01 50 00, Temporary Facilities and Controls.

B. Protect lawn areas or other areas from foot traffic or other uses until a healthy, total coverage stand of grass is obtained by using temporary barricades complying with the requirements of Section 01 50 00, Temporary Facilities and Controls.
   1. Barricade materials are subject to the Engineer’s approval.

3.7 MAINTENANCE

A. Duration:
   1. Begin maintenance operations immediately after seeding is performed and continue them throughout construction and the warranty period.
      a. Maintenance includes weeding, applying mulch as needed, controlling insects and diseases, mowing grass, and performing other particular operations as specified.

B. Watering:
   1. In seeded areas, keep the seed continually moist for proper germination, and maintain watering to prevent drying out or burning.
   2. Thoroughly water established lawn areas at least bi-weekly and in a satisfactory manner during the construction period until Final Acceptance.
   3. Furnish all necessary water, tank trucks, hoses, and appurtenances.

C. Mowing:

1. Cut seeded areas at intervals required to maintain a maximum height of 2-1/2 inches.

3.8 ATTACHMENTS

The following attachments are appended to this Section following the “END OF SECTION

A. ” marker:
   1. Schedule 32 92 19-1 - Standard Lawn Grass Mixture.
   2. Schedule 32 92 19-2 - Grass Mixture for Slopes Steeper Than 3H:1V (Not Maintained).
   3. Schedule 32 92 19-3 - Grass Mixture for Areas Not Maintained (Not Mowed).
   4. Schedule 32 92 19-4 - Temporary Grass Mixtures.
   5. Schedule 32 92 19-5 - Low Maintenance Grass Mixture.
   6. Schedule 32 92 19-6 - Grass Mixture for Areas Not Maintained (Wetland Areas).

Schedule 32 92 19-1 Standard Lawn Grass Mixture					
Formula and Species	Percent By Weight	Minimum Percent		Max. Percent Weed Seed	Seeding Rate (Lbs. Per 1000 SY)
		Purity	Germination		
Perennial Ryegrass Mixture (Lolium perenne). A combination of improved certified varieties with no one variety exceeding 50% of the total Ryegrass component.	20	98	90	0.15	4.0
Creeping Red Fescue or Chewings Fescue	30	98	85	0.15	6.0
Kentucky Bluegrass Mixture (Poa pratensis). A combination of improved certified varieties with no one variety exceeding 25% of the total Bluegrass component.	50	98	80	.20	11.0
					21.0 Total

Schedule 32 92 19-2 Grass Mixture for Slopes Steeper Than 3H:1V (Not Maintained)					
Formula and Species	Percent By Weight	Minimum Percent		Max. Percent Weed Seed	Seeding Rate (Lbs. Per 1000 SY)
		Purity	Germination		
Crownvetch (Coronilla varia)	45	99	70	0.10	4.0
Annual Ryegrass (Lolium multiflorum)	55	98	90	0.15	5.0

	9.0 Total

Schedule 32 92 19-3 Grass Mixture for Areas Not Maintained (Not Mowed)					
Formula and Species	Percent By Weight	Minimum Percent		Max. Percent Weed Seed	Seeding Rate (Lbs. Per 1000 SY)
		Purity	Germination		
Tall Fescue (Festuca arundinacea var. Kentucky 31)	70	98	25	0.15	15.0
Creeping Red Fescue or Chewings Fescue	30	98	85	0.15	6.0
					21.0 Total

Schedule 32 92 19-4 Temporary Grass Mixtures					
Formula and Species	Percent By Weight	Minimum Percent		Max. Percent Weed Seed	Seeding Rate (Lbs. Per 1000 SY)
		Purity	Germination		
Annual Ryegrass (Lolium multiflorum)	100	98	90	0.15	10.0
					10.0 Total

Schedule 32 92 19-5 Low Maintenance Grass Mixture					
Formula and Species	Percent By Weight	Minimum Percent		Max. Percent Weed Seed	Seeding Rate (Lbs. Per 1000 SY)
		Purity	Germination		
Hard Fescue Mixture (Festuca longifolia). A combination of improved certified varieties with no one variety exceeding 50% of the total Hard Fescue component.	55	98	85	0.15	13.0
Creeping Red Fescue	35	98	85	0.15	8.5
Annual Ryegrass (Lolium Multiflorum)	10	98	90	0.15	2.5
					24.0 Total

Schedule 32 92 19-6 Grass Mixture for Areas Not Maintained (Wetland Areas)					
Formula and Species	Percent By Weight	Minimum Percent		Max. Percent Weed Seed	Seeding Rate (Lbs. Per 1000 SY)
		Purity	Germination		
Tall Fescue (Festuca arundinacea var. Kentucky 31)	70	98	85	0.15	7.5
Birdsfoot Trefoil Mixture (Lotus corniculatus). A mixture of ½ Viking and ½ of either Empire, Norcen, or Leo.	20	98	80	0.10	2.0
Redtop (Agrostis alba)	10	92	80	0.15	1.0
					10.5 Total

END OF SECTION

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SECTION 32 93 00 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Division 1 General Requirements

1.2 SUMMARY

A. Requirements for landscape plantings including, but not limited to, the following:
   1. Furnishing and placing topsoil
   2. Furnishing and planting landscape plantings
   3. Selective pruning
   4. Mulching
   5. Fertilizing
   6. Watering
   7. Providing maintenance for landscape materials
   8. Clean up of extraneous landscaping materials

1.3 REFERENCES

A. American Nursery and Landscape Association (ANLA)/American National Standards Institute (ANSI): ANSI Z60.l, American Standard for Nursery Stock

B. American Joint Committee on Horticultural Nomenclature (AJCHN): AJCHN Standardized Plant Names

C. American Association of State Highway and Transportation Officials (AASHTO): AASHTO T 89, Standard Method of Test for Determining the Liquid Limit of Soils

D. Association of Analytical Communities International (AOAC): AOAC Official Methods of Analysis of AOAC International

1.4 ADMINISTRATIVE REQUIREMENTS

A. SPECIAL NOTE:

DESIGN BUILDER:
The contractor is alerted to the fact that this project is adjacent to the Bronx River Reservation, a designated park, under the jurisdiction of the Department of Parks and Recreation. The Design – Builder shall notify Westchester County of any herbicides, fertilizers, or other chemicals it is proposing to use for the project. Any herbicides, fertilizers, or other planting related chemicals shall be approved in writing by the Westchester County, prior to use on the project.

B. Environmental Requirements:
   1. The following seasonal constraints govern when the Work of this Section can be performed, except that when environmental conditions warrant, the Engineer may extend the specified dates.
      a. Allowable Plant Setting Dates:
         i. Deciduous Trees and Shrubs: October 15 to May 15
   2. Do not perform the Work of this Section when soil or weather conditions are unsuitable.
      a. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation of any kind present or occurring during the Work.
   3. The Work of this Section may include dormant or cold weather planting procedures for appropriate species, including staking plant materials and installing protective mulch on plant pit locations to protect the soil against freezing prior to winter plantings.

E. Existing Conditions:
   1. Plant landscape material after the final grades are established and prior to the planting of lawns unless otherwise acceptable to Engineer.
      a. Maintain the grade stakes until it is mutually agreed to by the parties concerned to remove them.
      b. If the planting of landscape material is to occur after lawn work, protect the lawn areas and promptly repair damage to lawns resulting from planting operations.
   2. Perform the Work of this Section in a manner that avoids damaging in-place utilities.
      a. Hand excavate as required.

F. Scheduling:
   1. Planting Schedule:
      a. Submit a proposed planting schedule to the Engineer that indicates the dates for performing each type of landscape work in various areas of the Site during normal seasons for such work.
         i. Once accepted, only revise schedule dates as approved in writing by the Engineer, and after submitting documentation of the reasons for the changes.
      b. Proceed with, and complete landscape work as rapidly as portions of the Site become available, working within seasonal limitations for each kind of landscape work required.
         i. Plant or install materials during the normal planting seasons for each type of plant material required.
      c. Correlate the planting schedule with specified maintenance periods to provide maintenance from the date of Substantial Completion.

G. Maintenance:
   1. Maintenance Period: Begin maintenance operations immediately after seeding is performed and continue them throughout construction and the warranty period.
   2. Maintenance Requirements: Maintenance includes, but is not limited to, weeding, applying mulch as needed, controlling insects and diseases, and performing other particular operations as specified.
      a. Maintain all mulched landscaped areas as specified throughout the warranty period, including rescuing and replacing mulch that has sloughed off and weeding mulched areas.
      b. Maintain and adjust stake wires if necessary.
      c. Perform pruning, other than initial pruning, as necessary to remove dead leaders and branches.
   3. Watering:

a. Thoroughly water plants at least bi-weekly and in a satisfactory manner during the construction period until acceptance.
b. Water plant root systems at regular intervals and keep the surrounding soil in condition to promote root growth.
c. Provide all necessary water, tank trucks, hoses, and appurtenances.

4. Maintenance Instructions:
   a. Prior to the expiration of the required maintenance period, submit typewritten recommended procedures to be established by MTA to maintain landscape work for one full year.

1.5 QUALITY ASSURANCE

A. Certifications:
   1. Analysis and Standards
      a. For standard products, include the manufacturer's certified analysis of the contents with the package
      b. For other materials, provide analysis of the contents by a recognized laboratory performed in accordance with methods established in the AOAC Official Methods of Analysis of AOAC International, wherever applicable.
   2. Plant and Planting Material Certifications:
      a. Submit certificates of inspection as required by governmental authorities.
      b. Submit other necessary data substantiating that the materials comply with the requirements specified.

1.6 SUBMITTALS

A. Submit the following information to the Engineer for approval in accordance with the requirements of Division 01– Submittal Procedures:
   1. Product Data: Plant species and quantity (Plant Count).
   3. Shop Drawings: Proposed planting schedule.
   4. Quality Assurance/Control Submittals:
      a. Nursery Test Reports
      b. Certificates: Certificates of inspection and other necessary data substantiating that the materials comply with the requirements specified.
   5. Manufacturer’s Instructions: Maintenance Instructions
   6. Closeout Submittals: Warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 3.2 below.

1.8 WARRANTY

A. Warrant landscape material for a period of one year after the date of acceptance against defects.
   1. Defects include death and unsatisfactory growth, except for defects resulting from neglect by Metro-North, abuse or damage by others, or unusual phenomena or incidents which are beyond the Design Builder’s control.

2. The date of acceptance is defined as the date for the inspection requested by the Design Builder after the last planting is installed and mulched, and at which time all conditions are acceptable to Metro-North and the Engineer.
3. Although periodic requests for payment will be accepted, their individual approval and subsequent payment does not activate the warranty period until all plants are in place and inspected by Metro-North and the Engineer.

B. Provide a warranty that does not limit plant replacement to "one time"; replace plants as many times as necessary in a single location until acceptance.

C. Submit the warranty in writing as part of the closeout submittals for the Contract.

PART 2 - MANUFACTURERS

2.1 MATERIALS

A. Plant Materials:
1. Provide plants true to type and name in accordance with the latest edition of AJCHN Standardized Plant Names nomenclature.
   a. Properly label each plant with its type and name.
   b. Where a formal arrangement or consecutive order of trees or shrubs are shown on the Contract Drawings, select stock for uniform height and spread, and label it with numbers to assure symmetry in planting.
   c. Provide the quantity of plants of the size, and variety shown and scheduled for landscape work and that comply with the recommendations and requirements of ANSI Z60.1 and recognized horticultural sources.
   d. Unless otherwise specified, provide Grade No. 1 plants in accordance with ANSI Z60.l.
2. Provide nursery-grown stock unless otherwise indicated or specified.
   a. Provide healthy, vigorous stock, grown in a recognized nursery in accordance with good horticultural practice and free of disease, injurious insects, eggs, larvae, and defects such as mechanical wounds, broken branches, decay, knots, sun-scald, injuries, abrasions, disfigurement, or any other defect.
   b. Provide plants having well-branched, and balanced root and top growth.
   c. Provide plants that have been growing in a climate comparable to that of the Site for at least two years.
3. "B and B" Plants:
   a. If plants are designated herein or on the Contract Drawings as "B and B," provide balled and burlap wrapped plants as follows:
      i. Form a ball from the original and undisturbed soil in which the plant grew.
      ii. Provide "B and B" plants having a ball diameter and depth in accordance with ANSI Z60.l and sufficiently large to include the necessary root system.
4. When containers are indicated or specified, furnish and plant plants in approved decomposable containers if possible.
   a. Remove non-decomposable containers as the plant is placed in ground.
5. Minimum Acceptable Plant Sizes:
   a. Provide plants of sizes conforming to the measurements indicated on the Contract Drawings or specified.
      i. Measure plants before pruning with the branches in normal position.

ii. Plants larger in size than indicated may be used if acceptable to the Engineer and if the sizes of root balls are increased proportionately, but at no additional cost to MTA.
a) If larger plants are used, proportionately increase the root ball or spread of roots in accordance with ANSI Z60.l rules.

6. Provide freshly dug landscape material.

2.2 ACCESSORIES

A. Anti-transpirant:
1. Provide an organic, non-toxic, biodegradable anti-transpirant spray that forms a clear, protective coating on foliage to help plants retain moisture.
2. Provide products as manufactured by the following firms:
a. Wilt Pruf Products, Inc., P. O. Box 469, Essex CT 06426-0469, telephone (800) 972-0726
b. Or approved equal.

B. Backfill:
1. Provide backfill for trees, shrubs, and root pruning trenches that consists of 4 parts topsoil to 1 part peat moss.

C. Backfill mix:
1. Provide backfill mix consisting of 4 parts topsoil, 1 part sphagnum peat, and 1 pound of bone meal for each cubic yard of topsoil.
2. Mix the backfill mix in bulk in a preparation area, and do not individually place and mix it within the plant pits.

D. Gypsum:
1. Provide gypsum as commercially available for planting uses.

E. Herbicides:
1. Pre-emergent herbicide:
Provide pre-emergent surface-applied herbicide to provide control of key grasses and broadleaf weeds.
2. Post-emergent herbicide:
Provide post-emergent herbicide designed for aquatic use with no restrictions on water use, specifically domestic use, after application.

F. Mulch:
1. Plant Mulch:
a. Provide brown, coarse textured tanbark, a by-product of the tanning process, or hardwood and pine bark consisting of ground or shredded bark, a fibrous material free from foreign material and substances toxic to plant growth and having the following properties.
i. Acid reaction: Four to five of that of shredded oak tree bark
ii. Moisture Content: 15 to 40 percent natural
iii. Particle Size: In the range from 1/2-inch to 2-inch diameter
iv. Grade: Processors Number 1

2. Mulch Binder:
   a. Provide non-asphaltic emulsion mulch binder consisting of a water soluble product
   b. Asphalt emulsion binders are not acceptable.

2.3 SOURCE QUALITY CONTROL

A. The Engineer may inspect landscape material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality.
   1. The Engineer has the right to further inspect landscape material for size and condition of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of work.

B. Inform the Engineer of the source of supply for plant material for this Contract so that he has the choice to select the materials at the source.
   1. Not less than 14 Days prior to installing plantings, submit complete and detailed information concerning the source of supply for each item of plant material on the planting list that appears on the Contract Drawings.
   2. Make all planting stock available for inspection in the nursery before it is dug.

C. Do Not Make Substitutions:
   1. If specified landscape material is not obtainable, submit proof of non-availability to the Engineer, together with a proposal for the use of equivalent material.

PART 3 - EXECUTION

3.1 PREPARATION

A. Utilities: Determine the locations of underground utilities and mark the locations with stakes or flags.

B. Excavation: When conditions detrimental to plant growth, such as rubble fill, adverse drainage conditions, or obstructions, are encountered during excavation notify the Engineer and obtain direction before planting.

C. Shrub Bed Preparation:
   1. For the shrub masses shown on the Contract Drawings, provide a continuous bed for each mass planting.
      a. Strip the bed of turf, and cultivate the entire area by incorporating peat and any required soil supplements into the top 6 inches of the existing topsoil.
         i. Cultivate the area by rototilling or plowing and discing so that the entire surface is tilled.
      b. Incorporate a quantity of peat into the topsoil equal to 3 inches of peat spread uniformly over the plant bed.
      c. For shrub, ground cover, and other planting beds in areas where extensive weed elimination is necessary, take the following additional measures to prepare the beds prior to disturbing the planting bed areas:

i. Apply a pre-emergent herbicide to the areas per the herbicide manufacturer's instructions. Take care to assure the pre-emergent herbicide is placed only in the area of the plant bed.
ii. Apply a frill or injection method application of a post-emergent herbicide to woody vegetation of a size larger than 1-inch caliper per the herbicide manufacturer's instructions.
    a) Apply this to all woody stumps remaining from previous clearing operation.
iii. Apply a spray application of a post-emergent herbicide to the proposed plant bed area per manufacturer's instructions.
    a) Do not extend spray beyond the bed areas.
    b) Verify that plants to be eliminated are in an active growing state prior to applying the spray.
iv. After a 7-Day waiting period, if weeds and the existence of vegetation in the area of the plant bed are evident, apply a second application.
v. After a 7-Day waiting period beyond the final post-emergent herbicide application, dig out woody plant stumps larger than 1 inch caliper, including the roots, and dispose of them off-site.
vi. Remove any existing vegetation not killed by the herbicide application by hand digging, and removed it off-site.
vii. Cultivate the beds as specified.

D. Plant Pit Preparation:
1. Prepare planting beds, plant trenches, and plant pits to the depths required below finished grade according to the recommended practices of ANSI Z60.l.
2. Excavate plant pits with vertical sides and flat bottoms.
    a. Construct plant pit diameters at least twice the diameter of the plant root ball.
    b. Refer to the planting details on the Contract Drawings for further information.
3. For pits for larger plants, such as deciduous shade trees and evergreens, provide sufficient depth to allow placing the root ball on the subgrade prior to backfilling.
    a. Construct plant pit diameters at least twice the diameter of the plant root ball with at least 12 inches of open excavation between the root ball and the vertical wall of the pit in all directions.
    b. Refer to the planting details on the Contract Drawings for further information.
4. Plan digging operations, particularly those on slopes, in order that actual planting operations will follow within 24 hours.
    a. In the case of winter season planting, do not excavate the plant pit and allow it to freeze.
        i. Perform digging operations so that plants can be properly installed and backfilled before the pit or the excavated material freezes.
        ii. Replace the mulch immediately to further protect the pit and root ball from freezing.

3.2 DELIVERY, STORAGE, AND HANDLING

A. Comply with the regulations applicable to landscape materials.
1. Include certificates of inspection required by governing authorities with shipments of landscape materials.

B. Temporary Storage:

1. When temporary storage or heeling-in of plants is required prior to shipping the plant stock, provide and prepare a suitable heeling-in ground or well-ventilated and cool storage shed located near the planting site.

C. Protect materials from deterioration during shipment, delivery, and while stored at the Site.
1. Handle and pack each species or variety of plant in an approved manner as required by soil and climatic conditions at the time of digging, and with due regard to shipping conditions and the time to be consumed in transit and delivery.
2. If accepted planting stock is not planted immediately, properly heel-in or store it. Stock left out of the ground and unprotected overnight, left with roots exposed to heat or freezing, or otherwise unprotected during transit, unloading, heeling-in, or planting will be rejected.
3. Do not remove container-grown stock from containers until planting time.

D. Deliver packaged materials in unopened containers showing the weight, analysis, and name of its manufacturer.
1. Deliver commercial fertilizer to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any commercial fertilizer that becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.

E. Deliver plant materials to the site in a protected condition to prevent wind damage and drying.
1. Provide plants that have been freshly dug at the time of delivery.
2. Plant material exhibiting a heated or sweated condition due to tight packing or poor ventilation is subject to rejection.

F. Provide data on the landscape material labels substantiating that the plants, trees, shrubs, and planting materials comply with specified requirements.
1. Deliver plants with a securely attached waterproof tag legibly indicating the plant’s name and size in accordance with ANSI Z60.l. In all cases, give precedence to botanical names over common names.
2. Provide at least one tagged plant in each bundle or lot.

G. Deliver landscape material after preparations for planting have been completed, and plant them immediately.
1. Do not prune landscape material prior to delivery unless otherwise approved by Engineer.
2. Provide protective covering for landscape material during shipment.
3. Do not drop balled and burlapped stock during delivery or handling.
4. Do not bend or bind-tie trees or shrubs in such manner as to damage their bark, break their branches, or destroy their natural shape.
5. If planting is delayed more than 6 hours after their delivery, set landscape material in the shade, protect them from weather and mechanical damage, and keep their roots moist by covering them with mulch, burlap, or other acceptable means of retaining moisture.

3.3 INSTALLATION

A. Plant Setting Operations:
1. Perform planting operations in conformance with planting details shown on the applicable Contract Drawings.
2. Set plants plumb and straight with allowance for settlement and in accordance with following:

a. Set plants to insure that after settlement the plant stem projects from the soil as much as before transplanting.
b. Set plants no shallower or deeper than they stood in the nursery, and excavate pits to the correct depth to set the plants at their proper height.

3. Setting Ground Cover Plants:
   a. Set each plant in a slight depression for catching rainwater, and top-off such depressions with 3 inches of mulch spread uniformly and compacted.
   b. Thoroughly water the ground cover bed immediately following planting.
4. Setting Balled and Potted Plants:
   a. Set each plant in prepared circular pits deep enough to accommodate a bed of topsoil not less than six inches deep under the ball or pot of shrubs and 12 inches under the ball of trees.
      i. Handle balled and burlapped plants by the earth ball, and not by the plant itself.
      ii. After placing balled and burlapped plants in their pits without removing the burlap, lay the burlap back from the ball.
      iii. Remove burlap from the top third of root balls, and completely remove ropes, twine, and wires from root balls.
         a) Completely remove containers from potted plants; however, keep the earth unbroken around roots.
         b) Place backfill mix in plant pits under and around root balls in 6-inch layers and tamp to eliminate voids.
      iv. At the halfway point in backfilling, flood the pit with water and continue backfilling after the water dissipates.
         a) Place a 3-inch layer of plant mulch within the ring prior to watering.
      v. Backfill pits to grade, and build up a ring of soil 3 inches deep over the edge of the plant pit to facilitate maintenance watering.

B. Immediately after plant setting and prior to watering, evenly apply mulch over planting areas not more than 3 inches deep.

C. Backfilling:
   1. Planting areas are considered to have sufficient topsoil for preparing beds; however, furnish and place the topsoil required within each plant pit for backfill mix.
      a. Place the backfill in 6-inch increments of depth.
      b. Work the backfill mix around plant balls in the pits and firmly tamp and/or puddle it as backfilling progresses.
      c. Take care to fill all voids in order to eliminate air pockets.
      d. If necessary, and always in the case of shade trees, hold each plant in a vertical position while the backfill soil is being placed.
      e. Remove sticks, sod, clods, or other material that could decompose and form air pockets in the planting media.
   2. On level ground and on relatively gentle slopes, leave a shallow basin, the diameter of the plant pit, around each plant.
   3. On steep slopes, pull sufficient soil to the lower side of the plant to form a shallow basin to catch and hold water.

D. Fertilization:
   1. After placing backfill, prior to final watering, and before mulching, apply fertilizer to all plants at the following rates:
      a. Deciduous Shrub: 1/4 pound per foot of height
      b. Evergreen Shrub: 1/8 pound per foot of height

E. Applying Plant Mulch:
   1. Remove weeds and deleterious materials from the area before spreading plant mulch.
   2. Mulch plant beds and pits as follows:
      a. Mulch plants after they are planted with tanbark to a uniform depth of 3 inches.
         i. Except in the case of winter planting, place mulch within 2 days after planting. In the case of winter planting, place mulch immediately.
         ii. Mulch tree pits to the outer edge of the earth berm.
         iii. Mulch the shrub plantings, which are masses, with mulch covering the entire area within the limits of the plant mass.
         iv. Adjust grades, allowing for the thickness of the mulch by cutting or filling.
      b. Rake the surface smooth and even over the prepared surface.
      c. After leveling the mulch, thoroughly soak it with water to the full depth of the mulch.

F. Pruning:
   1. Prune new plant material as necessary to remove injured twigs and branches and to compensate for loss of roots during transplanting, but never prune more than half of the original branch structure.
      a. Only prune damaged or broken main roots of new materials with a clean oblique cut immediately above the point of damage.
      b. Conform pruning operations to the best horticultural practices with due respect to natural form and growth characteristics of the individual species.
   2. Prune the tops of all deciduous stock at the time of planting or immediately thereafter.
      a. Preserve a single terminal leader when pruning deciduous trees.
      b. Paint cuts over 3/4-inch in diameter with an approved tree-wound paint.
   3. Prune existing trees indicated to remain to remove all dead and interfacing branches.
      a. Remove lower branches to provide a minimum clearance of 5 feet from finished grade.
      b. Paint cuts over 3/4-inch in diameter with an approved tree-wound paint.

3.4 REPAIR AND RESTORATION

A. If a plant dies or deforms after acceptance but during the warranty period, remove and replace it immediately; or, in the case of plants requiring proper seasonal planting, replace it in the next appropriate season, even if that season falls beyond the warranty period.
   1. If a large portion of a plant dies back causing a permanent or long-term deformity, replace it.
   2. Replace plants as many times as necessary in a single location during the warranty period.
   3. Replace all plants that are dead, unhealthy, or in a badly damaged condition with plants of the same exact type, species, and size originally specified.
   4. Do not make replacements during seasons definitely unfavorable for planting.
   5. Remove rejected trees or shrubs immediately from the Site, at no cost to Metro-North.
   6. Any delay on the part of the Design Builder in removing and replacing unsatisfactory materials is cause for Metro-North to have such work performed and to back charge the Design Builder for that work.

B. If damage to the structures, grounds, equipment, and/or their contents develops within the stipulated warranty period and is due to the use of material or workmanship which are inferior, defective, or not in accordance with this Contract, make good all unsatisfactory conditions or damage, and make good any work or materials or grounds which are disturbed in fulfilling the requirements of the warranty.

1. Make such additional repairs and replacements as required by the Engineer at no additional cost to MTA.

3.5 FIELD QUALITY CONTROL

A. Provide planting stock that conforms to the requirements of the ANSI Z60.l.
   1. Any plants furnished with fine hair roots omitted, or with main roots cut, will be immediately rejected.
   2. "B and B" plants arriving with broken or loose balls, or having "manufactured" earth in lieu of the original and undisturbed soil in which the plant grew will be rejected.

B. Provide planting stock declared and certified to be free from disease and insect pests of all kinds.
   1. Accompany each shipments, invoices, or orders of plants with all necessary inspection certificates, and give them to the Engineer upon arrival at the point of delivery.

C. Final inspection and acceptance of all planting stock will be made at the planting Site prior to the plants being placed in their permanent position.
   1. At the conclusion of the maintenance period, the Engineer will make an inspection of the landscaping work to determine its condition for acceptance.

3.6 CLEANING

A. As the landscape work is completed during the Contract and at intervals as directed by the Engineer, clear the site of all extraneous materials, including quantities of subsoil, rock, other spoils remaining from excavation after planting, and rubbish or debris; and leave all planting sites in a clean, safe, neat, sightly condition.

3.7 PROTECTION

A. Protect seeded areas from washouts by one of the methods specified in this Section.
   1. Should washouts and bare spots develop resulting from inadequate protection or otherwise, perform such reseeding as required until a healthy, complete coverage stand of grass is obtained.

B. Use temporary barricades to protect lawn areas from foot traffic or other uses until a healthy, total coverage stand of grass is obtained.
   1. Barricade materials subject to Engineer's approval.

END OF SECTION

SECTION 32 93 43 – TREES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Planting Soil Mix: Section 32 91 13.19
B. Seeding: Section 32 92 19

1.2 REFERENCES

A. Plant Nomenclature: Conform to the latest edition of "Standardized Plant Names" as adopted by the American Joint Committee of Horticultural Nomenclature.
B. Size and Grading Standards: Conform to the current edition of "American Standard for Nursery Stock" - Sponsor - the American Association of Nurserymen Inc., unless otherwise specified.

1.3 SUBMITTALS

A. List of Plants: Before plant material is shipped to the project site, submit a complete itemized list of all plants including the source of supply.
B. Product Data: Furnish the following with each planting material delivery.
   1. Invoice indicating sizes and variety of plant material.
   2. Certificates of inspection required by State and Federal agencies.
   3. Labels for each plant or bundles of plants indicating name and size.
C. Guys: Contractor shall submit one lineal foot of guying product along with all product information and manufacturer’s installation instructions.
D. Watering bag: Contractor shall submit one sample of watering bag product along with all product information and manufacturer’s installation instructions.
E. Quality Control Submittals:
   1. Worker's Qualifications Data: Names and addresses of 5 similar projects that each person has worked on during the past 2 years.

1.4 QUALITY ASSURANCE

A. Worker's Qualifications: The persons performing the planting and their supervisor shall be personally experienced in the planting and caring of plant material and shall have been regularly employed by a company engaged in the planting and caring of plant material for a minimum of 2 years.
B. Measure trees up to 4 inches in caliper at a point 6 inches above ground and trees over 4 inches in caliper at a point 12 inches above ground.
C. Do not use woody plant material from regions south of latitude 39 degrees unless such material has been lined out in nurseries located north of latitude 39 degrees for at least 2 growing seasons. Latitude 39 degrees is approximately a line from Annapolis, MD to Cincinnati, OH.
D. Upon approval by the Landscape Architect, the Contractor shall engage the services of the approved Transplanting Subcontractor and shall arrange a field meeting with the Landscape Architect, the Contractor, and the Transplanting Subcontractor prior to proceeding with any work. All transplanting work shall be done only by or under the direction of the approved Transplanting Subcontractor.

1.5 DELIVERY, STORAGE AND HANDLING

A. Notify the Landscape Architect 48 hours in advance of delivery of plant material and prior to start of transplanting.
B. Protect plants against climatic and mechanical injuries.
C. Deliver fertilizer in manufacturer's standard sized bags showing weight, analysis, and manufacturer's name. Store under a waterproof cover or in a dry place as approved by the Landscape Architect.

1.6 PROJECT CONDITIONS

A. Furnish all hoses, nozzles, piping, connections and water required to adequately water plants and turf. Contractor is not to rely on University water sources or irrigation system to provide adequate irrigation.

1.7 SCHEDULING

A. Plant deciduous, woody plants between March 15th and May 1st, or between October 15th and December 1st.
B. Plant evergreens between April 1st and May 15th, or between September 1st and October 15th.
C. Transplanting operations shall occur when the ground is not frozen or otherwise in an unsatisfactory condition for working, after leaf fall and before bud break on deciduous trees. This shall be October 15th to December 1st or March 1st to April 15th unless otherwise directed by the Landscape Architect.

1.8 PLANTING GUARANTEE

A. The guarantee shall extend for a period of one year from the date of physical completion for all new materials and all transplanted materials. Physical completion for the Work of this Section is the date or dates when all the planting operations, or seasonal portions of the planting operations, or replacement planting operations have been completed and are accepted by the Landscape Architect.
B. The contractor shall be liable for any damage to property by transplanting operations; all areas disturbed shall be restored to their original condition, to the satisfaction of the Landscape Architect.

PART 2 - PRODUCTS

2.1 TREES

A. Shrubs and Trees:
   1. Nursery grown stock unless otherwise indicated in the itemized plant list.
   2. Acclimated plants true to genus and species.
   3. Well-developed root and branch systems. Do not prune branches before delivery. Plants with girdling roots, roots that circle around the trunk of the tree, will not be accepted.
   4. Free of disease, insect eggs, bark abrasions, and disfiguring knots.
   5. Buds intact at time of planting.
   6. Balled and burlapped from soil that will hold a natural ball. Manufactured balls are unacceptable. Broken or crumbling root ball will be rejected.

7. Conform to size indicated or larger, or within the minimum - maximum size when so indicated. Larger plants cut back to specified dimensions will not be accepted.

B. Trees:
1. Mark north side of tree at nursery, and rotate tree when planting to face north at site whenever possible.
2. Single erect leader from ground to top, surrounded with uniformly arranged branches.
3. Free from frost cracks, broken bark, and dead or broken branches.
4. Transplanted, or root pruned 360 degrees at least once during the previous 3 years.
5. Plants with girdling roots, roots that circle around the trunk of the tree, will not be accepted.
6. Plants which have produced adventitious roots, a layer of lateral roots that form above the existing lateral roots when planted too deep in the nursery, will not be accepted.

2.2 PLANTING SOIL

A. Topsoil for Planting Soil: see specification Section 32 91 13.19: Planting Soil Mix

2.3 FERTILIZER

A. Bonemeal: Commercial, steamed finely ground material containing not less than 1.0 percent nitrogen and 11 percent phosphoric acid.
B. Commercial Fertilizer (10-6-4): Containing not less than 10 percent nitrogen, 6 percent available phosphoric acid and 4 percent water soluble potash.

2.4 MULCH

A. Mulch Materials: See specification Section 02 92 00: Soil Preparation and Mixes.

2.5 MISCELLANEOUS MATERIALS

A. Stakes, Deadmen, and Guy Stakes: Sound, durable White or Red Cedar, or other approved wood, free of insect or fungus infestation.
B. Guys: "ArborTie Green" by DeepRoot Partners L.P., 530 Washington Street, San Francisco, CA 94111, (415) 781-9700, (800) 458-7668; fax (800) 277-7668, or approved equal as approved by Landscape Architect. Material shall be flat, woven polypropylene, ¾" wide, 900 lb. break strength.
C. Anti-desiccants: Wilt-Pruf by Wilt-Pruf Products, Inc., P.O. Box 469, Essex, CT 06426, (203) 767-7033, or approved equal as approved by Landscape Architect.
D. Water Permeable Weed Barrier: Professional Landscape Fabric by Fabriscape, 6398 W. 74th St., Bedford Park, IL, 60638, (800) 552-0990, or approved equal as approved by Landscape Architect.

E. Burlap: Burlap and twine shall be natural fabrics. No synthetic burlap or twine shall be permitted.

F. Watering Bag: "Treegator Original" by Spectrum Products Inc., Youngsville, NC 27596, (866) 873-3428, or approved equal as approved by Landscape Architect.

PART 3 - EXECUTION

3.1 INSPECTION

A. Do not plant any plant material until after inspection and approval in writing of plant shipments by the Landscape Architect. Secure written approval of any substitutions before planting. Remove rejected material from planting areas.

3.2 PREPARATION

A. Planting Layout:
   1. Stake out tree locations and planting areas.
   2. Obtain layout approval from the Landscape Architect prior to excavations of plant pits and beds.

B. Plant Pit Dimensions: Minimum width 12 inches, measured at the ground surface.
   1. Balled and Burlapped Plants:
      a. Pit Depth: Not to exceed the ball depth.
      b. Pit Width: Measured at the ground surface, 3 times the width of the ball or wider as indicated.

C. Container Grown Plants: 2 times the diameter of the container measured at the ground surface.

D. Planting Beds: Excavate entire bed to a depth of 24 inches.

E. Bare Root Plants: Diameter equal to width of roots spread to natural position plus 24 inches, measured at the ground surface.

F. Excavation: Excavate pits to the dimensions specified. Dispose of excavated material off the site unless otherwise directed. Each planting hole shall be excavated only after the specific Plant Material has arrived on site and planting of this Material is ready to proceed. A tree spade shall not be used to excavate any planting hole, except where existing trees are being transplanted. If pit is excavated too deep, add planting soil above subgrade and tamp so that rootball does not shift.

3.3 PLANTING

A. Setting Plants:
   1. Mix “Terra-Sorb” evenly with the backfill soil at a rate of 5 tablespoons per caliper inch for balled & burlaped trees and shrubs, or 3 tablespoons per 5 gallons for containerized shrubs. For planting beds mix “Terra-Sorb” into the top 4 inches of soil at a rate of 1 pound (3cups) per 100 square feet prior to planting. It can be broadcast by shaker, spreader or hand then raked or rototilled into soil. Do not top dress on already established beds.
   2. Backfill pits with dry planting soil and firm to the level upon which plants were previously growing. Set plants plumb. Plant budded or grafted plants 2 inches below bud or graft line. Backfill dry planting soil in 6” lifts hand tamping each lift. Complete backfilling with planting soil and settle with water after backfilling is complete. At no time shall the stem(s) of any Plant Material be used as a lever in positioning or moving the material in the planting hole.
   3. Balled Plants: Set plants in position. Completely remove wire basket if present, legally disposing off-site. Remove burlap from top half and adjust to eliminate air pockets. Backfill dry planting soil in 6” lifts hand tamping each lift and settle with water.

4. Bare-root Plants: Set plant in position and place planting soil around roots settling with water. Use care to avoid bruising or breaking roots when firming soil. Prune bruised or broken roots.

B. Surface Finish: Form saucer as directed. Grade soil to form a basin on lower side of slope plantings, which will catch and retain water. Top dress basins with fertilizer spread evenly at the rate of 1-1/2 pounds per square yard of plant pit surface. Break saucers and basins before ground freezes.

C. Staking and Guying:

1. Trees are only to be staked when directed by the Landscape Architect.

2. Set tree stakes into solid ground below bottom of plant before backfilling. Place stakes 2 feet into the bottom of the Planting Hole, adjacent to, but never through any part of the root ball nor causing any injury to the root ball.

3. The stakes shall be placed on the upwind side of the tree, and shall be driven into the ground perpendicular to the surface.

4. Attach guys to stakes and trees as indicated. Guys shall be “ArborTie Green” as manufactured by DeepRoot Partners L.P, or approved equal as approved by Landscape Architect. Guys shall be attached to the tree using “ArborKnot” or approved equal as approved by Landscape Architect, and shall be attached to stake using a traditional nail or knot. Guys shall be attached approximately 6” below lowest branch of tree or 4.5’ above grade, whichever is lowest. “ArborKnot” to be tied as shown in ‘Figure 1’ on Page 8 of this specification section.

5. Connect multi-stem trees with “ArborTie Green” using “ArborKnot,” maintaining each stems relationship to one another.

6. Plant Material shall stand plumb once staking has been completed. Plant Material shall be able to sway a small amount without the stem(s) being girdled or “ArborTies” damaging the bark.
Installation of “ArborTies” shall follow all manufacturers’ recommendations.

Figure 1:

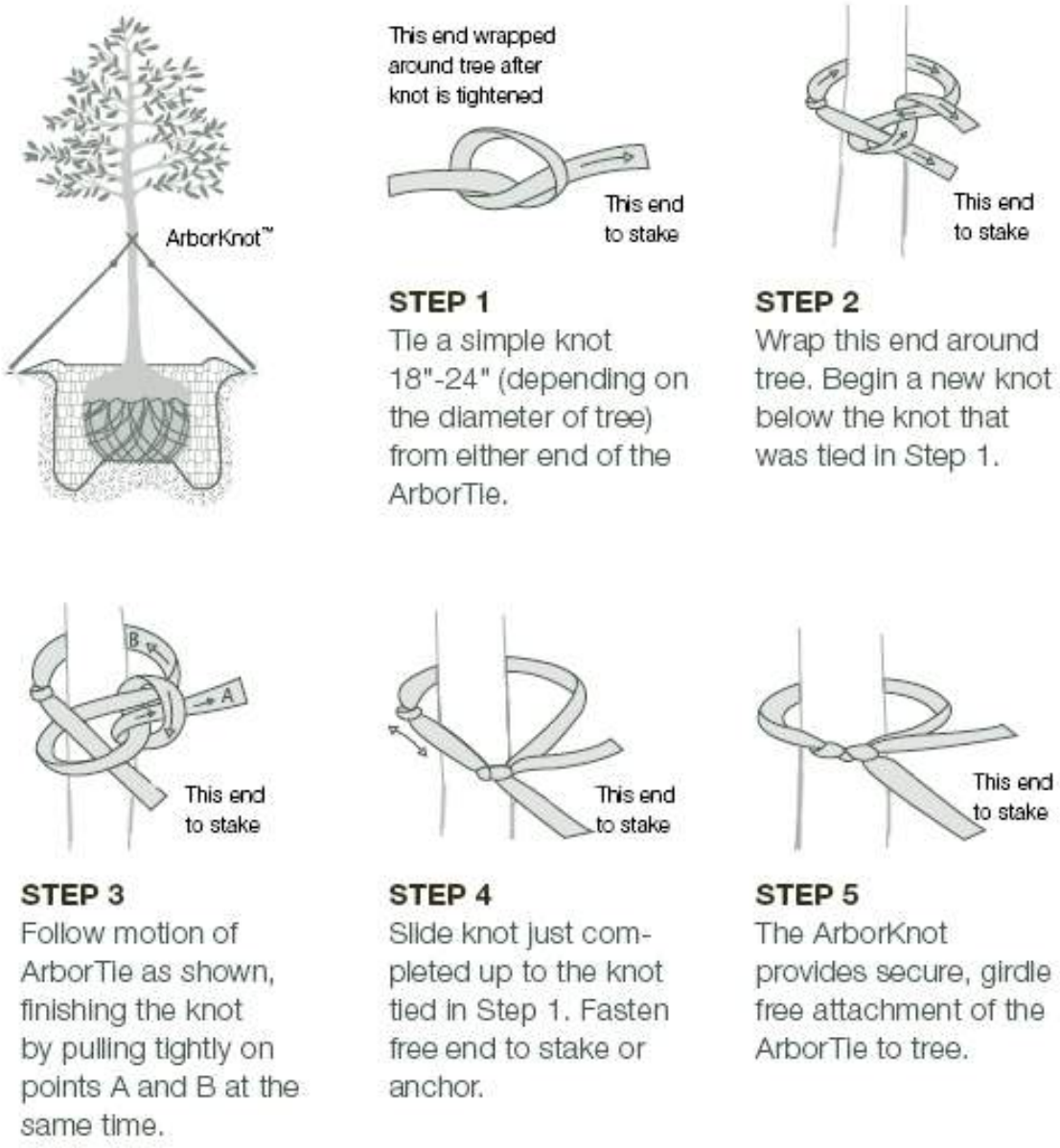

Image by Deep Root Partners, L.P.

D. Anti-Desiccant: Apply anti-desiccant spray to broadleaved ericaceous plants planted in the Fall season, as directed.

E. Mulching:
   1. In Planting Bed Areas only, install Water Permeable Weed Barrier, following manufacturer's recommendations, prior to spreading of mulch. Water Permeable Weed Barrier shall be placed above specified Topsoil as shown in the Detail page.
   2. Spread mulch over finished surface of each plant, plant bed and hedge trench in the following amounts:

F. Trees and Shrubs: Double Hammered Hardwood Bark: 3 inches

G. Perennials and Groundcovers: Double Hammered Hardwood Bark: 2 inches

H. Mulch shall not be applied within 3 inches of Plant stem(s).
I. Water plants thoroughly after mulching.
J. Pruning: Prune immediately after planting using sharp tools approved by the Landscape Architect. Remove broken, bruised, or otherwise damaged branches of the wood of deciduous plants only, maintaining the natural habit of the plant. Cut no leaders. All pruning must be completed under the supervision of a licensed arborist (International Society of Arboriculture or equivalent as approved by Landscape Architect). The Landscape Architect must approve all pruning prior to the work.
K. Establishment of Planting: Maintain plantings immediately following planting operations and continue throughout the guarantee period. All labels and tags shall be removed from Plant Material. Establishment of plantings shall consist of keeping plants in healthy, growing conditions by watering, weeding, cultivating, pruning, spraying, tightening of guys, re-mulching and by any other necessary operations of establishment. Watering shall be conducted according to Part '3.04 Watering' of this specification section. Treat plants with good horticultural preventative or remedial measures to control insects, diseases or rodents.

3.4 INSPECTIONS AND REPLACEMENTS

A. The following inspections apply to this Section.
   1. Delivery of plants to site prior to installation: Notify the Landscape Architect in writing at least ten days prior date of delivery of plants to site. Remove and replace dead, unhealthy, or impaired plants as directed by Landscape Architect.
   2. Physical Completion Inspection and Replacements: Notify the Owner in writing at least ten days prior to requested date of physical completion inspection. Remove and replace dead, unhealthy or badly impaired plants according to the original specification. Replace plants during the next planting season if this inspection is not within a planting season.
   3. End of Guarantee Inspection and Replacements: Remove stakes, guy wires and tree wrapping at the end of the one year guarantee period unless otherwise directed. Remove and replace dead, unhealthy or impaired plants according to original specification, as directed. Replace plantings during the next planting season if end of guarantee period is not within a planting season.
      PHYSICAL COMPLETION
   4. Physical completion of planted areas will be determined by the Landscape Architect when all areas have been planted, mulched and watered to the satisfaction of the Landscape Architect and Campus. Individual areas may be deemed "physically complete" at various times during the project at the discretion of the Landscape Architect.

B. One Year guarantee period will begin upon determination of physical completion, and the Contractor may request 50% payment.

3.5 FINAL ACCEPTANCE

A. Final Acceptance of planted areas will be determined when all areas have been satisfactorily maintained throughout the one year guarantee period to the satisfaction of the Landscape Architect and Campus. Individual areas may be accepted at various times during the project at the discretion of the Landscape Architect.

B. Once Final Acceptance is determined, the Contractor may request 100% payment and the Owner will assume all maintenance responsibilities.

END OF SECTION

SECTION 33 41 13 – MANHOLES AND DRAINAGE STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies requirements for manholes and drainage structures.

B. Definition of terms shall be in accordance with ASTM C 822.

1.2 REFERENCES

The following is a listing of the publications referenced in this Section:

A. American Association of State Highway and Transportation Officials (AASHTO)
   1. AASHTO M 198 Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets

B. American Concrete Institute (ACI)

   1. ACI 318 Building Code Requirements for Reinforced Concrete

C. American Society for Testing and Materials (ASTM)
   1. ASTM A 48 Gray Iron Castings
   2. ASTM A 536 Ductile Iron Castings
   3. ASTM C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   4. ASTM C 55 Concrete Building Brick
   5. ASTM C 117 Test Method for Material Finer Than 0.075mm
      a. (No. 200) Sieve in Mineral Aggregates by Washing
   6. ASTM C 136 Method for Sieve Analysis of Fine and Coarse Aggregates
   7. ASTM C 150 Portland Cement
   8. ASTM C 443 Joint for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
   9. ASTM C 497 Method of Testing Concrete Pipe, Manhole Sections, or Tile
   10. ASTM C 822 Definition of Terms Relating to Reinforced Concrete Pipe and Related Products
   11. ASTM C 891 Installation of Underground Precast Concrete Utility Structures
   12. ASTM C 913 Precast Concrete Water and Wastewater Structures

1.3 ENVIRONMENTAL REQUIREMENTS

A. Cold weather requirements shall conform to the applicable requirements of the Section 03 30 00 Cast-in-Place Concrete except that in a precast plant the ambient temperature may be below 40 degrees F providing that forms and product are preheated and heat cured and protected. Temperature recording devices shall be used.

B. Hot weather requirements shall conform to the applicable requirements of the section 03 30 00 Cast-in-Place Concrete.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

A. When approved by the Engineer, the Contractor may substitute cast-in-place manholes and drainage structures which conform in size and strength to the precast structures shown on the Contract Drawings and as specified in this Section. When approved by the Engineer, the Contractor may also substitute precast drainage structures which conform in size and strength to the cast-in-place structures shown on the Contract Drawings and as specified in the Section. Equivalent strength of substituted structures shall be based on structural design of reinforced concrete as outlined in ACI-318.

B. The Contractor may substitute castings of the same material and strength to those shown on the Contract drawings and designed to support the applicable live load with a factor of safety of 4.0 for castings subject to aircraft loads and 3.0 for other castings.

C. Design of lifting devices for precast structures shall conform to ASTM C 913.

D. Design of joints for precast structures shall conform to ASTM C 913. Unless otherwise shown on the Contract Drawings, joints shall be designed for leakage not to exceed 0.025 gallons per hour per foot of joint at 3 feet of head.

1.5 QUALITY ASSURANCE

A. Workers shall be experienced and skilled into the fabrication and installation of precast and cast-in-place concrete manholes and drainage structures.

B. Precast concrete manholes and drainage structures will be visually inspected by the Engineer when delivered to the construction site. Damaged material or material not meeting the requirements of this Section shall be removed from the construction site and replaced, at no additional cost to Metro-North.

C. Precast concrete manholes and drainage structures may be inspected by the Engineer at the place of manufacture.

D. Where manholes and drainage structures are cast-in-place, do not place concrete until the Engineer has inspected the formwork and verified that the dimensions and concrete reinforcing are in accordance with details shown on the Contract Drawings and as specified in this Section.

E. Conform to the applicable requirements for quality assurance of the Section 03 30 00 Cast-in-Place Concrete except that, if the concrete is precast, the producer shall maintain a fully equipped testing lab and employ a Quality Control Technician to perform Quality Control Tests for precast concrete shall consist of compression tests in a minimum of two cylinders for each day's production tested in accordance with ASTM C 39 for cylinders or ASTM C 497 for drilled cores. Acceptance shall be based on the requirements of ACI 318.

F. Tolerances of dimensions, squareness, joint surfaces, reinforcement location, and thickness of slabs and walls for precast structures shall conform to ASTM C 913.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with precast concrete manufacturer's instructions for unloading, storing and moving precast manholes and drainage structures.

B. Care shall be taken when storing precast concrete manholes and drainage structures to prevent damage to Authority or other public or private property, and any property so damaged shall be repaired at the Contractor's expense.

C. Each precast structure shall be clearly marked by indentation or waterproof paint to indicate the date of manufacture, manufacturer and identifying symbols and/or numbers shown on the Contract Drawings to indicate its intended use.

1.7 SUBMITTALS

A. Submit the following:
1. Shop drawings of precast concrete manholes and drainage structures and of concrete reinforcement for cast-in-place concrete manholes and drainage structures if used.
2. Catalog cuts of frames, grates and covers.
3. Catalog cuts of gaskets for joints in precast concrete manholes and drainage structures, including manufacturer's installation instructions.
4. Submit design calculations prepared by a Professional Engineer, licensed in the State of New York.
5. For the substitute designs of manholes and drainage structures, submit calculations, which verify that the substituted design is equivalent to the design shown on the Contract Drawings.
6. For substitute castings, submit calculations which verify that the substituted design will support the live loading including factor of safety or submit certified proof-of-design.
7. Submit certificate from gasket manufactured certifying that the proposed gaskets comply with the requirements specified in this Section and that the gaskets are compatible with the type of joint used.
8. Submit certified test results for the precast concrete compressive strength testing.
9. Submit plans, methods, equipment and procedures as applicable for:
    a. Prevention of accumulation of groundwater as specified in 3.2.
    b. Methods other than guide devices to avoid misalignment of joints during installation of precast structures as specified in 3.2
    c. Methods to prevent flotation of watertight structures as specified in 3.1.
10. Submit to Metro-North certified test data covering gradation and composition for the crushed stone for bedding proposed for use, together with one 75 pound representative sample of material.
    a. Submit the sample in a clean, sturdy container of which shall not permit loss of any material.
    b. Clearly label the container or bag of the sample with Contract location, title and number; the name of the material supplied; and location of the source.
    c. The Engineer will approve or disapprove the proposed material within 21 days after receipt of the sample.
    d. Do not deliver material to the construction site from any source until the Engineer has approved the material from that source.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. For each of the specified materials, manufacturer shall be one of the following, or approved equal.
   1. Manhole and Drainage Structure Frames, Covers and Grates
   2. Campbell Foundry Co.

2.2 MATERIALS

A. Concrete
   1. Concrete including concrete mixes shall conform to the applicable requirements of the Section 03 30 00 Cast-in-Place Concrete except as otherwise specified herein.

B. Precast Concrete Manholes and Drainage Structures
   1. Precast manholes and drainage structures shall be fabricated of air entrained concrete as shown on the Contract Drawings using ASTM C 150, Type II or Type III, Portland cement, having a minimum 28-day compressive strength of 4000 psi and a maximum water cement ratio of 0.45. Substitution of slag or fly ash for a portion of the cement shall not be required.
   2. There shall be a continuity of reinforcement at all corners of the structure.
   3. In uncontaminated soil, joints between precast sections, which occur four feet or more below finished grade, shall be sealed with rubber gaskets conforming to ASTM C 443 or a preformed flexible plastic gasket as specified below.
   4. “Ram-Nek”, as manufactured by Diplomatic Marine, Inc.
   5. “GS-79”, as manufactured by the General Sealants Corp.
   6. Or Approved Equal.

C. Steel Reinforcement
   1. Steel reinforcement shall conform to the Section 03 20 00 Concrete Reinforcing.

D. Silt Buckets
   1. All sanitary sewer manholes shall be provided with cast aluminum silt buckets as shown on the Contract Drawings.

E. Frames, Grates and Covers
   1. Castings for manhole and drainage structure frames shall be of the type shown on the Contract Drawings and shall be fabricated of ASTM A 48, Class 30b cast iron.
   2. Manhole covers and Drainage grates shall be of the types and materials shown on the Contract Drawings. Where cast iron is shown, manhole covers and drainage grates shall be fabricated of ASTM A 48, Class 30B cast iron. Where ductile iron is shown, Manhole covers and drainage grates shall be fabricated of ASTM A 536, Grade 60-40-18 or Grade 65-45-12, ductile iron and castings shall bear the letters “D.I.” in a clearly visible manner on the upper surface.
   3. Frames, covers or grates of other material shall be as shown on the Contract Drawings.

F. Masonry for Manhole and Drainage Frame Collars
G. Concrete Brick – ASTM C 55, Grade N-1.
H. Mortar – one part ASTM C 150, Type II Portland cement, Three parts sand and sufficient potable water to produce a plastic homogeneous mortar.
I. Crushed Stone for Pipe Bedding.

   1. Crushed limestone, trap rock or recycled Portland cement concrete aggregate conforming to the following gradation determined in accordance with ASTM C 136 and C 117. Recycled concrete aggregate shall contain not less than 95 percent crushed Portland

Cement Concrete and shall be in accordance with the requirements of the Section 32 12 00 Flexible Paving.

Sieve Size	Total Passing Percent by Weight
2 ½ inch	100
1 inch	60-100
¾ inch	45-85
3/8 inch	30-60
No. 10	14-30
No. 40	3-15
No. 200	0-3

2.3 FABRICATION

A. Manufacture for precast concrete structures shall conform to ASTM C 913.

PART 3 - EXECUTION

3.1 PREPARATION

A. For the cast-in-place structures, preparation shall conform to the Section 03 30 00 Cast-in-Place-Concrete.

B. Consult Contract Drawings for the proper orientation of the structure to ensure proper alignment with entering pipes, conduits or cables.

C. Do not install structures under site conditions known to result in loads heavier than that for which the structure was designed.

D. Immediately prior to placement in the excavation, precast concrete structures shall be inspected in the presence of the Engineer to verify that they are internally clean and free of damage. Damaged units shall be removed from the construction site and replaced, at no additional cost to the Authority. Subject to the approval of the Engineer, damaged precast concrete structures may be repaired in a manner that ensures that the structure will conform to the requirements of this Section and its intended use. Acceptance of repaired units is at the sole discretion of the Engineer.

3.2 INSTALLATION

A. Excavation and Backfill
   1. Excavate for manholes and drainage structures in accordance with the Section 31 20 00 Earth Moving in the location and to depth shown on the Contract Drawings. Provide clearance around the sidewalls of the structure as required for construction.
   2. If ground water is encountered, prevent accumulation of water in excavations by methods approved by the Engineer. Manholes or drainage structures shall be placed in a dry trench.
   3. Where the possibility exists of a watertight structure becoming buoyant in a flooded excavation, take necessary steps to avoid flotation of the structure.

B. Manhole and Drainage Structure Support and Backfilling
   1. Manholes and drainage structures shall be supported at proper grade and alignment on crushed stone bedding or other support system, as shown on the Contract Drawings.

2. Backfill excavations for manholes and drainage structures in accordance with the Section 31 20 00 Earth Moving.

C. Precast Concrete Manhole and Drainage Structure Installation
1. To ensure safety, precast structures shall only be lifted at the lifting points so designated by the manufacturer.
2. When lowering manholes and drainage structures into the excavations and joining pipe to the units, take precaution to ensure that the interior of the pipeline and structure remains clean.
3. Set precast structures so that they firmly and fully bear on crushed stone bedding, compacted in accordance with the provisions of the Section 31 20 00 Earth Moving or on other support systems shown on the Contract Drawings.
4. Assemble multi-section structures by lowering each section into the excavation. Lower, wet level and firmly position the base section before placing additional sections.
5. Ensure joint integrity by removing all foreign materials from joint surfaced and verifying that the sealing materials are placed properly. Avoid misalignment by using guide devices affixed to the lower section or as otherwise approved by the engineer.
6. Joint sealing materials may be installed at the Site or at the manufacturer's plant.
7. Verify that manholes and drainage structures installed satisfy required alignment and grade.
8. Remove knockouts or cut structure to receive piping so as not to create openings in excess of that required to receive pipe. Fill annular space with mortar.
9. Cut pipe to finish flush with interior of structure.
10. Shape inverts though manhole as shown on the Contract Drawings.

D. Cast-in-Place Concrete Manhole and Drainage Structure
1. Prepare crushed stone bedding or other support system shown on the Contract Drawings, to receive the base slab as specified for precast structures in 3.2 C.3.
2. Erect forms in accordance with the provisions of the Section 03 11 00 Concrete Forming and ensure that they are braced against all movement.
3. Install reinforcing steel in accordance with the details shown on the Contract Drawings and the provisions of the Section 03 20 00 Concrete Reinforcing.
4. After formwork and concrete reinforcement installations have been inspected and approved by the Engineer, place and cure concrete in accordance with the provisions of Section 03 30 00 Cast-in-Place Concrete.
5. Complete installation in accordance with the applicable requirements of 3.2 C above.

E. Installation of Castings
1. Set frames using mortar and masonry as required. Radially laid concrete brick shall have ¼ inch thick vertical joints at the inside perimeter. Lay all concrete brick in a full bed of mortar and completely fill all joints. Where more than one course of concrete brick is required, stagger vertical joints.
2. Existing frames, grates and covers shall be carefully removed, cleaned of all mortar fragments to the satisfactions for the Engineer and reset to the required elevation in accordance with the requirements specified in 3.2 E for installation of castings.
3. When removal of an existing concrete wall is required, the concrete shall be removed so as not to damage the existing vertical reinforcing bars. The vertical bars shall be cleaned of all concrete to the satisfaction of the Engineer and bent into the new concrete top slab or spliced to required vertical reinforcement, as shown on the Contract Drawings.

4. Clean and apply sand-cement-bonding compound on all existing concrete surfaces to receive cast-in-place concrete. Sand-cement bonding compound and its application shall be in accordance with the requirements specified in the Section 03 30 00 Cast-in-Place Concrete.

3.3 FIELD TESTS

A. Field tests will be used by the Engineer to evaluate and approve cast-in-place concrete in accordance with the Sections 03 30 00 Cast-in-Place Concrete.

3.4 PROTECTION

A. Protection and curing of concrete shall be in accordance with the Section 03 30 00 Cast-in-Place Concrete.

END OF SECTION

SECTION 33 71 19 - ELECTRICAL UNDERGROUND DUCTS AND MANHOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for underground electrical work, materials and products and raceway systems.

B. Related Sections:

1 Section 03 30 00 - Cast-In-Place Precast Concrete
1. Section 03 40 00 - Precast Concrete
2. Section 26 05 00 - Common Work Results For Electrical
3. Section 26 05 26 - Grounding and Bonding
4. Section 26 05 63 - Acceptance Testing for Electrical Systems
5. Section 26 05 19 - Low Voltage Electrical Power Conductors and Cables
6. Section 26 05 33.13 - Conduit for Electrical Systems
7. Section 31 20 00 - Earth Moving

1.2 REFERENCE STANDARDS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

B. American Society for Testing and Materials (ASTM):
1. ASTM A 36, Specification for Structural Steel.

C. Federal Specifications (Fed. Spec.):
1. Fed. Spec. FF-S-107C(2), Screws, Tapping and Drive.
2. Fed. Spec. A-A-1923, Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry) Group II (Shield, Expansion Bolt Anchor) Type 4 (Wedge expansion anchors).

1.3 QUALITY CONTROL

A. Equipment Manufacturer:
1. In cases where the Design Builder contemplates using equipment not made by the first named manufacturer of these specifications, refer to Section 26 05 00 of these specifications for special requirements and/or substitution requirements.

1.4 GENERAL REQUIREMENTS

A. Section 26 05 00, Common Work Results for Electrical, with the following additions and modifications.

B. Factory Tests:
   1. Determine applicable soil-density relationships for underground electrical installation bedding per applicable soil tests as defined in Division 2 of the Specifications.
   2. Determine soil-density relationships for compaction of backfill material as defined in Division 2 of the Specifications.

1.5 SUBMITTALS

A. Submit the following information for approval:
   1. Catalog Information:
      a. Conduit. (All Types)
      b. Handholes.
      c. Precast Concrete Manhole and Handhole.
      d. Manhole Frame and Cover.
      e. Handhole Frame and Cover.
      f. Sump Pumps.

1.6 CERTIFICATES

A. Material and Equipment: Provide manufacturer's statement certifying that the product supplied meets or exceeds contract requirements.
   1. Precast Concrete Manhole and Handhole and accessories.
   2. Manhole frame and cover.
   3. Precast Polymer Concrete Handhole

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Basic Electrical Materials: Those products such as building wire, connectors, fittings and similar devices as required for work of this Section are as specified in other Sections of these Specifications.

B. Provide materials and equipment listed by UL, when such equipment is listed or approved.

C. Conduit and Conduit Spacers: Conform to Section 26 05 33.13.

D. Wire and Cable: Conform to Section 26 05 19.

E. Grounding Material: Conform to Section 26 05 26.

2.2 WATERPROOFING OF CONDUIT JOINTS

A. General: Ensure that equipment and materials for waterproofing conduit joints complies with the following manufacturers for quality, installation procedures and guaranteed end results.
   1. Rigid Metal Conduit:
      a. Thread sealant: As recommended and approved by the conduit manufacturer.
      b. Cleaning solvent: As recommended and approved by the conduit manufacturer.
   2. Non-Metallic Conduit:
      a. All weather, quick-set joint cement: Approved by the conduit manufacturer.
      b. Cleaning solvent: As recommended and approved by the conduit manufacturer.

2.3 CAST JUNCTION BOXES

A. Provide weatherproof and watertight junction boxes for flush in-ground installation where indicated on the Contract Drawings.
   1. Construction: Cast iron type with necessary boxes, checkered cover and neoprene gasket for flush mounting.
   2. Install junction box in concrete pad as detailed on the Contract Drawings.
   3. Provide box of minimum size of 8-inches x 8-inches; larger as required by the
   4. National Electrical Code, or as indicated on the Contract Drawings and/or required by the field conditions.
   5. Acceptable Manufacturers:
      a. Appleton.
      b. Crouse Hinds.
      c. Killark.

2.4 PRECAST CONCRETE MANHOLES & HANDHOLES

A. Provide precast concrete, watertight manholes/handholes as indicated on the Contract Drawings. Provide manholes/handholes complete with necessary, required and specified appurtenances such as watertight locking type covers, cable racks, pulling-in irons, ground rods and ladder and water drainage provisions.

B. Acceptable manholes/handholes manufactures as indicated on Contract Drawings or as approved equal.

2.5 PRECAST POLYMER CONCRETE HANDHOLES

A. Provide precast polymer concrete, handholes as indicated on the Contract Drawings. Provide handholes complete with necessary, required and specified appurtenances such as watertight locking type covers, cable racks, ground rods and water drainage provisions.

B. Provide precast polymer concrete handholes constructed of sand-gravel aggregate bonded together with a matted fiberglass-reinforced polymer concrete. In no assembly can the cover design load exceed the design load of the box. All covers are required to have a minimum coefficient of friction of .50 in accordance with ASTM C 1028 and the corresponding Tier Level embossed on the top surface.

C. Provide handhole with a standard cover suitable for sidewalk application with occasional non-deliberate light vehicular traffic and a service load of 2270 kg over a 250 mm (5000 pounds over a 10-inch) square and a heavy duty cover suitable for driveway and parking lot application with occasional non-deliberate heavy vehicular traffic and a service load of 6800 kg over a (15,000 pounds over a 10-inch) square, wherever needed.

D. Provide enclosures, boxes and covers to conform to all test provisions of the latest version of the ANSI/SCTE 77 "Specification For Underground Enclosure Integrity" for Tier 22.

E. Provide handhole with the following identification cast into the cover as appropriate for the service: "Electric" and "Communications".

F. Acceptable Manufactures
1. Quazite
2. CDR Systems
3. Strongwell
4. Hubbell Enclosures
5. Or approved equal.

2.6 WATERPROOFING PRECAST CONCRETE MANHOLES

A. Provide asphalt compound coating of either the solvent type or the emulsion type. However, mixtures of the two types in the Project is not permitted.
1. Solvent Type: Brush or spray-on asphalt compound, cold-applied.
2. Emulsion-Type: Brush or spray-on asphalt-base, clay emulsion with fibers, cold- applied.
3. Acceptable Manufacturers:
   a. W. R. Meadows, Inc.; SEALMASTIC
   b. Coopers Creek; Coopers Black
   c. Tnemec; 46-465
   d. Or Approved Equal.

2.7 SUPPORTS AND FASTENERS

A. Supporting Devices: Carbon steel angles, channels, and bars meeting material requirements of ASTM A36. Pre-engineered UL Listed supporting systems of electrogalvanized steel or electrogalvanized steel PVC coated products may be used in lieu of field fabricated support systems.

B. Fasteners: Provide anchoring devices to anchor conduit or raceway, and supporting devices or pre-engineered supporting systems, to the structure, of the type designed for the specific purpose of anchoring into structure materials at intended point of installation. RAWL PLUGS ARE NOT PERMITTED.
1. Toggle and Expansion Bolts: Fed. Spec. FF-B-588C.
2. Self-Tapping Screws: Fed. Spec. FF-S-107C(2).
3. Conform anchoring devices for fastening into solid masonry or concrete to Fed Spec. FF-S-325 Group II, Type 4, Class 1 for expansion type anchors.

2.8 UNDERGROUND WARNING TAPE

A. Metal detectable polyester material, with minimum one-inch high lettering. Overcoated graphics to read, “CAUTION-BURIED ELECTRIC LINE” for electric lines and/or “CAUTION -BURIED TELEPHONE” for telephone lines. APWA color to be red for electric lines and orange for telecommunication or fiber-optic lines.

B. Acceptable Manufacturers:
   1. Brady #91600 Series
   2. Presco
   3. Seton
   4. Or Approved Equal

2.9 GROUNDING

A. Ground rods are to be copper clad steel with diameter adequate to permit driving full length of the rod minus 6 inches, which extends above the finished concrete slab. Conform to Section 26 05 26 of these Specifications.

B. Ground Wires: 600 Volt, size as indicated or required by code minimum #6.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Incoming Service Requirements:
   1. Coordinate work and work requirements with Servicing Utility Company and the Owner prior to installation.
   2. Contact the following representative of the Serving Utility Company for electrical service installation requirements and to verify exactly the work required by the utility company to perform under this Contract.
      a. Contact information at ConEd will be provided upon award of contract.

B. General Requirements: (For Underground Work)
   1. Install underground conduit systems in accordance with Article 300-5 of the NEC, in accordance with previous requirements of this Section, and the following requirements exceeding NEC:

      a. Perform earthwork for buried conduit.

      b. Install Concrete Encasement as indicated and detailed.

      c. Where detailed on the Contract Drawings, underground conduits, both single and banked, concrete encase and reinforce using steel reinforcing rods as indicated on the Contract Drawings.

d. Bank conduits to the extent indicated and secure same in place with install separators at 5-foot intervals. Provide separators with sufficient strength to prevent displacement of conduits when placing backfill or pouring concrete encasement.

e. Lay conduit lines to grade a minimum of three inches per 100 feet. Grade conduit lines away from buildings, except conduit lines running between buildings, without intervening handholes or manholes shall be level.

f. Where conduit lines run to manholes, handholes or similar underground structures, grade conduits to drain to such.

g. Construct underground conduit lines to be watertight. Stagger conduit couplings in banks of conduits.

h. Unless otherwise indicated on drawing or details, where conduits change direction or turn up at equipment, transformers, buildings, terminal poles, etc., use long sweep PVC coated rigid galvanized steel conduit elbows.

i. Provide two feet minimum cover over conduits and over concrete encasement of conduit, unless indicated otherwise or specified.

j. Where conduits are to be turned up into equipment or transformer pads, extend the concrete encasement for the conduits up to the top of the concrete pad and provide a 3/4" chamfer around exposed top edges. Isolate the concrete encasement for the conduits from the concrete pad for the equipment or transformer pad. Provide 2" high crushable fiber materials around duct bank encasement.

k. Extend conduits 6 inches above concrete slab surface. Install insulating grounding bushing on all conduits. Perform concrete work as specified in Division 3 "Cast-In-Place Concrete".

l. Where conduits are to be turned up at terminal poles, extend the concrete encasement for the conduits up pole to a height of 24 inches above finished grade and be provided with a 3/4" chamfer around all exposed top edges. Perform concrete work as specified in Division 3 "Cast-In-Place-Concrete".

C. Underground Duct Bank with Concrete Encasement: Construct underground duct bank lines of individual conduits encased in concrete as indicated. Except where rigid galvanized steel conduit is indicated or specified, use only one kind of conduit in any one duct bank. Use ducts no smaller than 4 inches in diameter unless otherwise indicated. Provide concrete encasement rectangular in cross-section surrounding the bank and provide at least 3 inches of concrete cover for ducts. Separate conduit by a minimum concrete thickness of 2-inches, and maintain a separation, between conduit centerlines, of seven and one-half inches. Separate power conduits from telephone, communication and/or data highway conduits a minimum of 24 inches of earth or concrete thickness of 8 inches, unless otherwise indicated.

D. Place duct bank lines with a continuous slope downward toward manholes, handholes and away from buildings with a pitch of not less than 3 inches in 100 feet. Except at conduit risers, change direction of bends in runs exceeding a total of 10 degrees, either vertical or horizontal, by long sweep bends having a minimum radius of curvature of 25 feet. Sweep bends may be made up of

one or more curved or straight sections or combinations thereof. Use only manufactured bends with a minimum radius of 18 inches for use with conduits of less than 3 inches in diameter and a minimum radius of 36 inches for conduits of 3 inches in diameter and larger. Terminate conduits in end-bells where duct bank lines enter manholes and handholes as indicated on the Contract Drawings.

E. Provide separators compatible with the conduit utilized and conforming to those specified in other Sections of these Specifications. Stagger the joints of the conduits by rows and layers so as to provide a duct bank line having the maximum strength. During construction, protect partially completed duct bank lines from the entrance of debris such as mud, sand, and dirt by means of suitable conduit plugs. As each section of a duct bank line is completed from manhole to manhole, from manhole to building or structure and/or from handhole to handhole, draw a testing mandrel not less than 12 inches long with a diameter 1/4 inch less than the size of the conduit, through each conduit, after which draw a brush having the diameter of the duct bank and stiff bristles through until the conduit is clear of particles of earth, sand, and/or gravel; immediately install conduit plugs. Provide a plastic pull rope, having a minimum of 3 additional feet at each end, in telephone and spare duct banks.

F. Underground Conduit for Service Feeders: Indicate underground conduit for service feeders into buildings on the Contract Drawings. Where rigid steel conduit bank is utilized, protect the ends of the conduit by threaded metal caps or brushings; coat the threads with graphite grease or other suitable coating. Clean and plug conduit before conductors are installed.

G. Conform concrete to that specified in Section 03 30 00 of this Specification.

H. Backfilling: Provide a continuous plastic warning tape centered about 12 inches above the top of the underground duct bank. Conform concrete to that specified in Division 3 of this Contract. Progress backfilling as rapidly as the construction, testing and acceptance of the work permits. Ensure backfill is free from roots, wood, scrap material, and other vegetable matter and refuse. Install and compact backfill as specified in Section 31 20 00.

3.2 CONDUIT WATERPROOFING

A. Non-Metallic Conduit:
   1. Plastic PVC Conduit (Schedule 40): Liberally coat the end of the conduit with an approved all weather, quick-set clear cement before joining. Insert joint into the coupling, pushing firmly and rotating conduit until it reaches the pre-formed stopping ridge within the coupling.

3.3 PRECAST CONCRETE MANHOLES & HANDHOLES

A. Provide steel bar pulling-in irons bent in the configuration of a deformed “Z” and cast in the walls and floors. Pocket pulling-in irons in the floor and center directly under the manhole cover. Locate pulling-in irons in the wall not less than 6 inches above or below, and opposite the conduits entering the manhole. Locate the pulling-in-irons such as not to interfere with the cable distribution racks. Project pulling-in-irons into the manhole approximately 4 inches. Zinc-coat irons after fabrication.

B. Ensure cable racks, including hooks and insulators, are sufficient to accommodate the cables and spaced not more than 24 inches horizontally. Provide wall bracket of glass reinforced nylon channel. Provide support brackets of glass reinforced nylon and of the removable type. Provide insulators of dry-process glazed porcelain.

C. Provide aluminum step: aluminum alloy AA designation 6061-T6. Coat that portion of aluminum step being embedded in concrete with heavy bodied bituminous paint.

3.4 MANHOLE/HANDHOLE INSTALLATIONS

A. Where openings into manholes are below final finished grade, extend openings to the required elevation with either concrete or brick suitably arranged to support or anchor the frames and covers. Obtain engineer approval of the construction method and procedure before any work is done.

B. Where required for pulling cables, furnish and install in the walls of the manholes and handholes, a sufficient number of inserts for the proper attachment of cable supports.

C. In general, properly dress and rack cable/or wire on the support arms and insulators around the walls of the manholes and handholes, providing slack where required for future rearrangements. Install cable support brackets, along with the support arms and porcelain insulators, on each wall of the manhole and handhole. Secure cables within manholes and handholes to the insulators by marlin rope. Use proper regard for neat and orderly appearance and location, and provide accessibility for future connections. Take care not to damage the walls of the manholes and handholes during cable pulling.

D. Provide each manhole with a 1 inch diameter hole in the floor for a ground rod. Provide a 3/4 inch diameter by 10 foot long copper clad ground rod installed in one corner with 6 inches of the ground rod left extended above finished floor. Ground metal work to the ground rod.

E. Conform manhole frames and covers to requirements as outlined above in these Specifications; and ensure Engineer approval.

F. Provide a manhole drainage system as indicated on the Contract Drawings.

3.5 PRECAST CONCRETE MANHOLE & HANDHOLE FRAME AND COVER INSTALLATION

A. Where required, make final adjustment of frame to elevation using materials grade rings.
   1. Set precast grade rings in Waterproof Mortar. Do not exceed 3/4-inch maximum and 3/8-inch minimum mortar thickness. Wet, but do not saturate precast grade rings immediately before laying.
   2. Precast grade ring: Pre-set to proper plane and elevation using wedges or blocks of cementation material not exceeding one spare inch wide on each side. Permit no more than four wedges or blocks per grade ring. Incorporate wedges or blocks in fresh mortar in a manner to completely encase each. Crown fresh mortar to produce squeeze-out between grade rings. Tool exposed joints with appropriately shaped tool and compact mortar edge into joints. Clean off excess mortar prior to initial mortar set.

3. Bolt manhole frames in place on manhole top section, or on leveling units if required, after installing 2 inch thick preformed plastic sealing compound on bearing surface of manhole frame. Remove excess sealing compound squeeze- out after manhole frame is bolted in place.
4. Use bolts of sufficient length to properly pass through leveling units, if used, engage full depth of manhole top section inserts and allow enough threaded end to pass through manhole frame to properly tighten nut and washer. Tighten manhole frame bolts after mortar has cured.

3.6 PRECAST CONCRETE HANDHOLES & MANHOLES FIELD COATING

A. Clean cast-iron or steel frames, covers and gratings not buried in masonry of mortar, rust, grease, dirt and other deleterious materials by an approved blasting process, and give a coat of bituminous coating material. Clean surfaces that cannot be cleaned satisfactorily by blasting to bare metal, by wire brushing, or other mechanical means. Wash surfaces contaminated with rust, dirt, oil, grease or other contaminants with solvents until thoroughly cleaned. Immediately after cleaning, coat surface with a pretreatment coating or give a crystalline phosphate coating. As soon as practicable after the pretreatment coating has dried, prime treated surfaces with a coat of zinc chromate primer and coat with synthetic exterior gloss enamel.

3.7 WATERPROOFING PRECAST CONCRETE HANDHOLES & MANHOLES

A. Apply a specified protective coal-tar-based coating of two applied coats, minimum, to surfaces in direct contact with in ground cover to obtain a minimum 12.0 dry mil total applied surface thickness. Apply coating in strict conformance with manufacturer's requirements.

B. Application: The coating may be either shop or field applied. Apply coating to the exterior of manhole components.

3.8 CONNECTIONS TO MANHOLES/HANDHOLES

A. Construct concrete encased duct bank lines connecting to manholes or handholes to have a tapered section adjacent to the manhole or handhole to provide shear strength. Construct manholes and handholes to provide for keying the concrete envelope of the duct bank line into the wall of the manhole or handhole. Use vibrators when this portion of the envelope is poured to assure a seal between the envelope and the wall of the manhole or handhole.

3.9 CABLE DUCT BANK SHIELDS

A. Provide shields of a suitable type manufactured for the purpose where cables enter and leave manholes and handholes and other duct bank entrances.

3.10 EARTHWORK

A. Excavate to depths as required for manholes and handholes.

B. Remove waste excavated materials not required or suitable for backfill on the project from the site as directed. Provide sheeting and shoring as necessary for protection of work and safety of personnel. Remove water from excavation by pumping or other approved method.

3.11 GROUNDING

A. Provide non-current carrying metallic parts associated with electrical equipment with a maximum resistance to solid “earth” ground not exceeding the values indicated in Section 26 05 63 of these Specifications.

3.12 DISSIMILAR SURFACES ISOLATION

A. Paint aluminum surfaces at point of contact with wood, concrete or masonry construction with one coat (minimum dry mil thickness - 5.0 mils) of bituminous paint.

B. Clean away excess or misplaced paint materials from aluminum surfaces and adjoining construction materials.

3.13 TEST

A. Field Tests: Field test of electrical equipment and conform systems to those specified in Section 26 05 63 of these Specifications.

END OF SECTION

METRO-NORTH COMMUTER RAILROAD COMPANY
SCARSDALE & HARTSDALE STATION IMPROVEMENTS
CONTRACT NO. 100106733

APPENDIX

ASBESTOS & LEAD PAINT SURVEY REPORT

HARLEM LINE
SCARSDALE STATION
1 DEPOT PLACE,
SCARSDALE, NY 10583

PROJECT: CAPITAL – HARLEM LINE – SCARSDALE STATION: STATION BUILIDNG, PEDESTRIAN OVERPASS, PLATFORMS & STAIRCASES REPAIRS

PREPARED FOR:

METRO-NORTH RAILROAD
DEPARTMENT OF SAFETY & SECURITY
420 LEXINGTON AVENUE – 9TH FLOOR
NEW YORK, N.Y. 10017

CONTRACT # 1000039090
OSS TASK NUMBER: HAL-18-040-AL

PREPARED BY:

ENVIRONMENTAL PLANNING & MANAGEMENT, INC.
1983 Marcus Ave., Suite 109
Lake Success, NY 11042

EPM's Project No. 18041-3

October 1st, 2018
Revised 6-13-19
18041-03 SCARSDALE STATION ASBESTOS LEAD SURVEY REPORT.doc **/ MA**

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EXECUTIVE SUMMARY

As directed, from August 15th through August 28th, and September 14th, 2018, Environmental Planning & Management (EPM) certified New York State Department of Labor (NYSDOL) Asbestos Inspectors Michael Aprahamian (certificate number 97-02855), Darren Frank (certificate number 02-21260) and Andrzei Zabrocki (certificate number 93-20787) performed an asbestos and lead containing coating survey at Metro North Railroad (MNRR) Scarsdale Station, located in Scarsdale, New York. Mr. Frank and Mr. Zabrocki are also a USEPA Lead Inspectors (certificate number LBP-I-9510-1 Exp.: 11/16/2019 and certificate number LBP-I-11979-1 EXP.: 6/3/2021). On September 14th, 2018, EPM's Mr. David Sundell was the USEPA Lead Inspector (certificate number LBP-I-I153646-1 EXP.:5/3/2018).

The purpose of the survey was to identify the location and quantity of asbesto s containing materials (ACM greater than 1%) and the presence of lead containing paint, that might be impacted by the scope of work as described in drawings titled '*Design Build Service for Scarsdale and Hartsdale Station Improvements*', prepared by STV and dated July 13th, 2018 (30% Design Plan Submission). While the drawing set does not include drawings for the station building and pedestrian overpass, EPM was directed to include these structures in the investigation.

The scope of work includes:

- Remove shelters and associated items;
- Remove communications hut;
- Remove, signs, benches, recycling bins, and schedule panels
- Remove platform lighting;
- Replace platforms, piers and associated items;
- Remove platform canopies and associated items;
- Replace or repair specific staircases and ramps associated with the platforms;
- Replace existing inbound side glass panel at the inbound side of the pedestrian overpass.

In addition, EPM was directed to inspect the Station Building, existing elevator and the pedestrian overpass. The building structure and parking canopy adjacent to the outbound side of the track is not included in the scope of work.

A summary of presumed ACMs identified at the Riverdale Station are provided in Table I below:

Table I – Summary of Presumed Asbestos Containing Materials – Scarsdale Station						
SAMPLE #	ASBESTOS MATERIAL FOUND	LOCATION	CONDITION	APPROXIMATE QUANTITY	UNITS	PHOTO #
No Access	Presumed ACM Terrazzo Floor and waterproofing underlayment	Station Building – Common Area	Unknown	535	SF	1
No Access	Presumed ACM waterproofing beneath ceramic floor tile setting bed	Station Building Men's Restroom	Unknown	73	SF	2
No Access	Presumed ACM waterproofing beneath ceramic floor tile setting bed	Station Building Women's Restroom	Unknown	68	SF	3
No Access	Presumed ACM roofing material/tar paper beneath terra-cotta tiles	Pedestrian Overpass	Unknown	2260	SF	4

With the exception of the aforementioned presumed ACMs, no other asbestos containing materials were identified.

The following materials tested, were determined to be non-asbestos containing:

Platforms, Stairs and Overpass

- Gray caulk present at joint between county staircase and south end of inbound platform;
- Blue/gray caulk present the ends of rubber joints at inbound and outbound platform construction joints and at stair E2 and Ramp E2;
- Brown joint filler beneath blue/gray caulk at staircase E2 and Ramp E2;
- Dark gray caulk present at canopy column and drain penetration with platforms;
- Brown joint filler present beneath rubber joints at the inbound and outbound platform construction joints;
- Brown ridged insulation (Fluffy) beneath EPDM rubber roof membrane preset on top of the north and south canopies of the outbound platform and north end of the north canopy of the outbound platform;
- Black roof flashing tar present at the perimeter of the north and south canopies of the inbound platform and the north canopy of the outbound platform;
- Brown ridged board roof insulation present at the inbound north canopy and outbound north canopy;
- Black mastic sealant at construction joint between platform and stair E3;

- Gray caulk present at representative bases of light posts on both platforms. Note: applied sealant at upper light post joint is silicone and not suspect to contain asbestos;
- Light gray caulk present expansion joint of stairs E4 and inbound platform and expansion joint at pier 12E;
- Light gray caulk at drain penetration of underside of canopy at the inbound and out bound platforms;
- Dark gray caulk present joint between outbound platform and stairs between piers 5E and 6E;
- Green mortar present at terra-cotta roof tile openings and of the stair portion of pedestrian overpass canopy; and
- Tar paper material present beneath the terra-cotta roofing tiles and roof associated with the stair section of the pedestrian overpass canopy.

Station Building and Shelter

- White caulk present at perimeter of stucco panels throughout the exterior of the station building;
- White/gray stucco material present on the exterior of the station building;
- White putty present at the exterior of the sash glazing of the windows throughout the exterior of the station building;
- Gray caulk present at specific drain pipe connections around the exterior of the station building;
- Black caulk present at specific drain pipe connections around the exterior of the station building;
- Light gray caulk present the exhaust conduit penetration at the shelter;
- Black with white dots insulation material present at terra-cotta roofing tile joints and joint between shelter terra-cotta tile roof and station building wall;
- Tar paper material present beneath the terra-cotta roofing tiles and roof associated with the station building/canopy;
- Beige floor tile with yellow glue (inseparable) present as bottom layer of floor tile in the ticket office;
- 12” by 12” brown floor tile with brown specs with yellow glue (inseparable) present as the top layer of floor tile in the ticket office;
- Gray concrete/plaster board present as wall material inside the ticket office;
- Gypsum board present as wall and ceiling material inside the boiler room;
- Joint compound and tape associated with the gypsum board in the boiler room;

- 12” by 12” beige floor tile with yellow glue (inseparable) present as flooring in the boiler room;
- Green floor tiles and associated mastic present beneath 5/8” plywood and ceramic flooring;
- Ceramic floor tile grout and mortar present in the corridor of the station building
- 2’ by 2’ suspended gypsum ceiling panels located inside old concession room in the station building;
- Gypsum board material present at the ceiling of the cellar area in the station building;
- Brown paper insulation collected from the interior of representative doors throughout the station building;
- Black backing board material present in the relay cabinet located in the elevator machine room adjacent to the outbound track;
- Light gray ceiling plaster present above cement board throughout the main floor of the station building;
- Black 12” by 12” floor tile and associated adhesive (inseparable) present in the Concession room;
- Representative braided wire insulation located in the ceiling junction box of the Concession room;
- Cement board located in the corridor on ceiling of station building (over the light gray plaster);
- Joint compound and associated tape present at walls of the of the women’s restroom, Concession room and corridor of the station building;
- White gypsum board present in the Janitor’s closet, and Concession room walls;
- Gray gypsum board present Men’s and Women’s room walls;
- Mortar associated with ceramic floor tiles located in the Men’s and Women’s restrooms;
- Grout associated with ceramic floor tiles located in the Men’s and Women’s restrooms;
- Mortar associated with 4” by 4” ceramic wall tiles present in the Men’s Restroom
- Grout associated with 4” by 4” ceramic wall tiles present in the Men’s and women’s Restrooms;
- White caulk present at sink and toilet joint in the women’s restroom and the urinal joint in the Men’s restroom;
- Terrazzo flooring material present in common area of station building;
- Gray grout present at white ceramic wall tiles located in the common area; and

- Dark gray grout present at one-inch squares patterns along the perimeter of the common area.

According to the Occupational Safety and Health Administration (OSHA), any detectable amount of lead in the paint sample constitutes the coating as lead containing. OSHA does not recognize the USEPA definition of lead-based paint (LBP). The following surfaces, as well as those that are homogeneous, are lead-containing:

Platforms, Stairs and Overpass:

- Brown paint on metal canopy art located on top of the inbound platform;
- Green paint on the metal beams that support the inbound and outbound canopies;
- Black paint on railing associated with the inbound platform;
- Gray paint on the exterior of the Tick vending machine (TVM) located at the center of the inbound platform;

  Green paint present on the supports for the staircase and canopy associated with the pedestrian overpass;
- Green paint present on the frame of the Communications hut located adjacent to the inbound platform beneath the overpass;
- White paint present on the interior ceiling of the overpass;
- Green paint present on typical salt box located on the platforms;
- Yellow paint present on plastic over concrete tactile warning stirps located on the platforms;
- Light blue paint present on the metal elevator control cabinet and metal housing for oil cabinet in the elevator machine room;
- Gray paint present on the electrical cabinet present in the elevator machine room;
- Dark gray paint present on the pull box present in the elevator machine room; and
- Black paint present on the wood backing board present in the elevator machine room.

Station Building and Shelter:

- Brown paint present on wood associated with station building on exterior components of the station building such as wood trim, window frames, window bump out, window sashes, doors, buttresses, roof facia, columns, station roof

facia, and oil shed trim;

- Brown paint present on the metal drain upper down spouts of the station building;
- Brown paint present on the interior and exterior of the metal oil shed door;
- Black paint present on the oil tank present in the oil shed;
- Tan paint present on the exterior of the concrete/s tucco walls of the station building and the oil shed;
- White paint present on the wood soffits of the station building;
- Green paint present on the terracotta roof tile present on the st ation building, oil shed roof, platform canopy and canopy overpass;
- White paint present on the concrete parti tion wall located in the cellar of the station building;
- Gray paint present on the concrete floor on the cellar;
- White paint present on the sheet metal ceiling in the cellar;
- White paint present on the metal unction box located in the cellar;
- Black paint present on the metal pipe in the cellar;
- Black paint present on the metal pipe in the attic of the station building;
- White colored cement board material (bot h layers) present on t he ceilings of the corridor, common area, ticket office, and the walls and c eiling of the s tation building;
- White paint present on the wood attic access hatch frame;
- White paint present on the interior wood frame of the ticket office window and the wood slats on the lower part of the east wall inside the station building;
- Light brown paint present on the metal radiator in the ticket office;
- White paint present on the concrete walls of the ticket office;
- White paint present on the gypsum board located in the ticket office;
- Light blue paint present on the wood s lats along the south wall of the boiler room inside the station building;
- Black paint present on the wood cove base along the perimeter of the concession room;
- Tan paint present on the wood slats located on the ceiling of the conces sion room (above the suspended ceiling panels);
- Light brown ceramic wall tiles present on t he floor in the men's and wom en's restrooms;
- Tan ceramic floor tiles present in the men's and women's restrooms;
- Beige ceramic floor tile present in the corridor of the station building;

- Light brown paint present on window frame in the men's restroom;
- White paint present on the interior of the windows in the men's and women's restrooms;
- Tan paint present on the window frames located in the interior of the men's and women's restroom;
- Silver paint present on the metal radiators and associated pipes located in the men's and women's restrooms;
- Silver paint present on the metal pipe riser located in the corridor;
- Tan paint present on the wood doors to the men's and women's restrooms;
- White paint present on the wood, concrete and brick walls and the metal pipe inside the janitor's closet;
- Gray paint present on the interior of the window frame in the janitor's closet;
- Tan paint present on the interior of the door and associated frame inside the janitor's closet;
- White paint present on wood wall trim, door frame, window and frame located in the common area of the station building;
- Tan paint present on wood wall trim, interior of wood door, and wood ceiling trim located in the common area;
- White glazed bricks present as the walls of the common area;
- Silver paint present on metal radiator located in the common area;
- Black paint present on the metal screen in front of the fireplace in the common area;
- Black paint present on the metal arm rests on the benches on the common area; and
- Green paint present on the exterior of the wood phone booths located in the common area.

1.0 INTRODUCTION

At the request of Metro North Railroad (MNR) Office of System Safety, EPM performed a limited investigation for the presence of asbestos containing materials (ACM) and limited lead containing coating inspection of the Harlem line's Scarsdale Station, located at 1 Depot Place, in Scarsdale, New York. The asbestos investigation was conducted in general conformance with guidelines established by the Environmental Protection Agency (EPA) in the Guidance for Controlling Asbestos Containing Materials in Buildings, Office of Pesticides and Toxic Substances, DOC #560/5-85-024, and 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA). The limited pre-renovation lead containing coating inspection was performed to provide the project with information necessary for the development of work practices and controls in compliance with OSHA's Lead Standard for the Construction Industry, Title 29 Code of Federal Regulations 1926.62 (29 CFR 1926.62).

The scope of work for the survey consisted of the following tasks:

1. Perform a visual inspection of station areas and components to identify the potential location of asbestos containing materials (ACMs) that might be affected by the proposed scope of work as described by the previously mentioned drawings and to determine the delineation of homogeneous areas to be impacted.
2. Collect bulk samples of suspect ACM.
3. Submit the suspect ACM bulk samples to a certified laboratory for Polarized Light Microscopy (PLM) and/or Transmission Electron Microscopy (TEM), where applicable, analysis.
4. Investigate painted surfaces utilizing The Niton XLp 300A analyzer.
5. Prepare a report summarizing data collection techniques, analysis procedures, and location of asbestos containing materials (greater than 1% as determined by PLM or TEM) and lead containing coatings.

2.0 ASBESTOS SURVEY

The field inspection were conducted from August 15th through August 28th, and September 14th, 2018, by Environmental Planning & Management (EPM) certified New York State Department of Labor (NYSDOL) Asbestos Inspectors Michael Aprahamian (certificate number 97-02855), Darren Frank (certificate number 02-21260), David Sundell (certificate number 03-00147), and Andrzei Zabrocki (certificate number 93-20787), at Metro North Railroad (MNRR) Scarsdale Station, located in Scarsdale, New York.

Field information was organized as per the AHERA concept of homogenous area (HA). The delineation of homogeneous areas at the site was based on criteria including material type and location. Materials suspected of containing asbestos were identified for the area inspected. When suspect ACM's were found, representative bulk samples from the homogeneous material group (material which is uniform by color, texture, construction application date, and general appearance) were collected. Three bulk samples were collected per homogeneous material group from miscellaneous materials.

One hundred fifty-eight (158) bulk samples were collected from fifty-five (55) homogeneous areas from the following suspect materials:

<u>Platforms, Stairs and Overpass:</u>

- Gray caulk present at joint between county staircase and south end of inbound platform;
- Blue/gray caulk present the ends of rubber joints at inbound and outbound platform construction joints and at stair E2 and Ramp E2;
- Brown joint filler beneath blue/gray caulk at staircase E2 and Ramp E2;
- Dark gray caulk present at canopy column and drain penetration with platforms;
- Brown joint filler present beneath rubber joints at the inbound and outbound platform construction joints;
- Brown ridged insulation (Fluffy) beneath EPDM rubber roof membrane preset on top of the north and south canopies of the outbound platform and north end of the north canopy of the outbound platform;
- Black roof flashing tar present at the perimeter of the north and south canopies of the inbound platform and the north canopy of the outbound platform;
- Brown ridged board roof insulation present at the inbound north canopy and outbound north canopy;
- Black mastic sealant at construction joint between platform and stair E3;
- Gray caulk present at representative bases of light posts on both platforms. Note:

applied sealant at upper light post joint is silicone and not suspect to contain asbestos;

- Light gray caulk present expansion joint of stairs E4 and inbound platform and expansion joint at pier 12E;
- Light gray caulk at drain penetration of underside of canopy at the inbound and outbound platforms;
- Dark gray caulk present joint between outbound platform and stairs between piers 5E and 6E;
- Green mortar present at terra-cotta roof tile openings and of the pedestrian overpass canopy;
- Tar paper material present beneath the terra-cotta roofing tiles and roof associated with the pedestrian overpass canopy;

Station Building and Shelter:

- White caulk present at perimeter of stucco panels throughout the exterior of the station building;
- White/gray stucco material present on the exterior of the station building;
- White putty present at the exterior of the sash glazing of the windows throughout the exterior of the station building;
- Gray caulk present at specific drain pipe connections around the exterior of the station building;
- Black caulk present at specific drain pipe connections around the exterior of the station building;
- Light gray caulk present the exhaust conduit penetration at the shelter;
- Black with white dots insulation material present at terra-cotta roofing tile joints and joint between shelter terra-cotta tile roof and station building wall;
- Tar paper material present beneath the terra-cotta roofing tiles and roof associated with the station building/canopy;
- Beige floor tile with yellow glue (inseparable) present as bottom layer of floor tile in the ticket office;
- 12” by 12” brown floor tile with brown specs with yellow glue (inseparable) present as the top layer of floor tile in the ticket office;
- Gray concrete/plaster board present as wall material inside the ticket office;
- Gypsum board present as wall and ceiling material inside the boiler room;
- Joint compound and tape associated with the gypsum board in the boiler room;

- 12” by 12” beige floor tile with yellow glue (inseparable) present as flooring in the boiler room;
- Green floor tiles and associated mastic present beneath 5/8” plywood and ceramic flooring;
- Ceramic floor tile grout and mortar present in the corridor of the station building
- 2’ by 2’ suspended gypsum ceiling panels located inside old concession room in the station building;
- Gypsum board material present at the ceiling of the cellar area in the station building;
- Brown paper insulation collected from the interior of representative doors throughout the station building;
- Black backing board material present in the relay cabinet located in the elevator machine room adjacent to the outbound track;
- Light gray ceiling plaster present above cement board throughout the main floor of the station building;
- Black 12” by 12” floor tile and associated adhesive (inseparable) present in the Concession room;
- Representative braided wire insulation located in the ceiling junction box of the Concession room;
- Cement board located in the corridor on ceiling of station building (over the light gray plaster);
- Joint compound and associated tape present at walls of the of the women’s restroom, Concession room and corridor of the station building;
- White gypsum board present in the Janitor’s closet, and Concession room walls;
- Gray gypsum board present Men’s and Women’s room walls;
- Mortar associated with ceramic floor tiles located in the Men’s and Women’s restrooms;
- Grout associated with ceramic floor tiles located in the Men’s and Women’s restrooms;
- Mortar associated with 4” by 4” ceramic wall tiles present in the Men’s Restroom
- Grout associated with 4” by 4” ceramic wall tiles present in the Men’s and women’s Restrooms;
- White caulk present at sink and toilet joint in the women’s restroom and the urinal joint in the Men’s restroom;
- Terrazzo flooring material present in common area of station building;
- Gray grout present at white ceramic wall tiles located in the common area; and

- Dark gray grout present at one-inch squares patterns along the perimeter of the common area.

Non-suspect materials observed at the site include:

- Concrete platforms and ramps;
- Concrete pier that support the platforms;
- Joint between concrete piers and platforms is rubber bearing;
- Metal structural steel (I-beams, angles, stringers);
- Lamp post upper base joint is sealed with silicone sealant;
- Fiberglass insulation present in the attic of the pedestrian overpass;
- Rubber and/or silicone overpass glazing sealant and sash sealant;
- Non-suspect vinyl insulation present on platforms lighting and signs, elevator machine room and shelters, overpass lighting and heaters, and communications hut, and;
- Solid wood doors (exterior entrances to common are, boiler room, and concession area;

Table I contains a detailed summary of the inspection results. Laboratory analytical data is included as Appendix E.

2.1 Analytical Procedures

Bulk samples of suspect asbestos containing materials (ACM) were analyzed using Polarized Light Microscopy (PLM) with dispersion staining, as described in 40 CFR Part 763 and National Emissions Standards for Hazardous Air Pollutants (NESHAPS) regulations. Non-friable organically bound (NOB) materials were analyzed as per Environmental Laboratories Accreditation Program (ELAP) item 198.1, "Polarized Light Microscopy Method for Identifying and Quantifying Asbestos in Bulk Samples". NOB materials which tested negative by PLM were analyzed using Transmission Electron Microscopy (TEM) method. TEM analysis is the only method that can be used to determine if non-friable organically bound materials (NOBs) can be considered non-asbestos containing.

The bulk samples were analyzed by Alpha Labs LLC, 14-26 28th Avenue, LIC, NY. Alpha Labs LLC is accredited by the New York State Environmental Laboratory Accreditation Program (ELAP # 11833) and the National Voluntary Laboratory Accreditation Program (NVLAP # 200691-0) of the National Institute of Standards and Technology (NIST). Laboratory accreditation documentation is included as Appendix D.

2.2 Asbestos Survey Findings

Presumed ACMs are summarized in Table I on page 2. Based on laboratory analysis conducted by layers, it was determined that the following materials are not asbestos containing:

Platforms, Stairs and Overpass

- Gray caulk present at joint between co unty staircase and south end of inb ound platform;
- Blue/gray caulk pr esent the ends of rubber joints at i nbound and outbound platform construction joints and at stair E2 and Ramp E2;
- Brown joint filler beneath blue/gray caulk at staircase E2 and Ramp E2;
- Dark gray caulk present at canopy column and drain penetration with platforms;
- Brown joint fill er present beneath rubber joints at the i nbound and outbound platform construction joints;
- Brown ridged ins ulation (Fluffy) beneath EPDM rubber roof m embrane preset on top of the north and s outh canopies of the outbound platform an d north end of the north canopy of the outbound platform;
- Black roof flashing tar present at the perimeter of the north and south canopies of the inbound platform and the north canopy of the outbound platform;
- Brown ridged board r oof insulation present at the inbound north canopy and outbound north canopy;
- Black mastic sealant at construction joint between platform and stair E3;
- Gray caulk pres ent at representative bases of light posts on both platforms. Note : applied sealant at upper li ght post joint is silicone and n ot suspect to c ontain asbestos;
- Light gray caulk pr esent expansion joint of stairs E4 and inbound platform and expansion joint at pier 12E;
- Light gray caulk at drain penetration of underside of canopy at the inbound and out bound platforms;
- Dark gray caulk present joint between outbound platform and st airs between piers 5E and 6E;
- Green mortar present at terra-c otta roof tile open ings and of the pedestr ian overpass canopy;
- Tar paper material present beneath the terra-cotta roofing tiles and roof associated with the pedestrian overpass canopy;

Station Building and Shelter

- White caulk pr esent at per imeter of st ucco panels t hroughout the exter ior of th e station building;
- White/gray stucco material present on the exterior of the station building;
- White putty present at the ext erior of t he sash glazing of the wind ows throughout

the exterior of the station building;

- Gray caulk present at specific drain pipe connections around the exterior of the station building;
- Black caulk present at specific drain pipe connections around the exterior of the station building;
- Light gray caulk present the exhaust conduit penetration at the shelter;
- Black with white dots insulation material present at terra-cotta roofing tile joints and joint between shelter terra-cotta tile roof and station building wall;
- Tar paper material present beneath the terra-cotta roofing tiles and roof associated with the station building/canopy;
- Beige floor tile with yellow glue (inseparable) present as bottom layer of floor tile in the ticket office;
- 12" by 12" brown floor tile with brown specs with yellow glue (inseparable) present as the top layer of floor tile in the ticket office;
- Gray concrete/plaster board present as wall material inside the ticket office;
- Gypsum board present as wall and ceiling material inside the boiler room;
- Joint compound and tape associated with the gypsum board in the boiler room;
- 12" by 12" beige floor tile with yellow glue (inseparable) present as flooring in the boiler room;
- Green floor tiles and associated mastic present beneath 5/8" plywood and ceramic flooring;
- Ceramic floor tile grout and mortar present in the corridor of the station building
- 2' by 2' suspended gypsum ceiling panels located inside old concession room in the station building;
- Gypsum board material present at the ceiling of the cell ar area in the station building;
- Brown paper insulation collected from the interior of representative doors throughout the station building;
- Black backing board material present in the relay cabinet located in the elevator machine room adjacent to the outbound track;
- Light gray ceiling plaster present above cement board throughout the main floor of the station building;
- Black 12" by 12" floor tile and associated adhesive (inseparable) present in the Concession room;
- Representative braided wire insulation located in the ceiling junction box of the Concession room;

- Cement board located in the corridor on ceiling of station building (over the light gray plaster);
- Joint compound and associated tape present at walls of the of the women's restroom, Concession room and corridor of the station building;
- White gypsum board present in the Janitor's closet, and Concession room walls;
- Gray gypsum board present Men's and Women's room walls;
- Mortar associated with ceramic floor tiles located in the Men's and Women's restrooms;
- Grout associated with ceramic floor tiles located in the Men's and Women's restrooms;
- Mortar associated with 4" by 4" ceramic wall tiles present in the Men's Restroom
- Grout associated with 4" by 4" ceramic wall tiles present in the Men's and women's Restrooms;
- White caulk present at sink and toilet joint in the women's restroom and the urinal joint in the Men's restroom;
- Terrazzo flooring material present in common area of station building;
- Gray grout present at white ceramic wall tiles located in the common area;
- Dark gray grout present at one-inch squares patterns along the perimeter of the common area.

3.0 LEAD PAINT SURVEY

The lead survey field inspections were conducted from August 15th through August 28th, and September 14th, 2018, by Environmental Planning & Management (EPM) certified USEPA Lead Inspectors Darren Frank (certificate number LBP-I-9510-1 Exp. : 11/16/2019,) Andrzei Zabrocki, (certificate number LBP-I-11979-1 EXP.: 6/3/2021), and David Sundell (certificate number LBP- I-I153646-1 EXP.:5/3/2018) at Metro North Railroad (MNRR) Scarsdale Station, located in Scarsdale, New York.

3.1 Testing Procedures using the Niton XLp 300A XRF Analyzer:

In lieu of an applicable lead sampling protocols for a non-residential property the limited lead containing coating (LCC) inspection was conducted in general conformance with the United States Environmental Protection Agency (US EPA) 40 CFR Part 745 "Lead; Identification of Dangerous Levels of Lead; Final Rule", dated January 5, 2001, and the US Department of Housing and Urban Development's (HUD) "Guidelines for the Evaluation and Control of Lead- Based Paint Hazards in Housing" (HUD Guidelines), dated June 1995, revised 2012. HUD has established a threshold of 0.5% by weight and/or 1.0 μg/cm^2 at and above which a paint is considered to be lead-based.

The Niton XLp 300A Series Lead-Based Paint Analyzer is a complete lead-based paint (LBP) analysis system, which quickly, accurately, and non-destructively measures the concentration of LBP on tested surfaces. The XLp 300A relies on the measurement of the K-shell and L-shell X-rays to determine the amount of lead present in a painted surface. The measurement of both K-shell and L-shell X-rays allows for the penetration of many layers of paint thereby providing an increased level of accuracy for the measurement of lead without being significantly affected by the thickness or number of layers of paint on the surface of the sample.

The Niton XLp 300A simultaneously detects K-shell and L-shell X-rays, analyzes them with an automatic positive/ negative decision, and correction for substrate bias, and age of source. All negative readings in all paint test modes are verified by negative K-Shell X-ray readings. Patent-pending TrueDepth™ Technology identifies and locates deeply buried lead, and provides exact depth of leaded paint in inches.

The Niton XLp 300A analyzer has two modes of operation, the "Standard Mode" and the "K & L Mode". In the "Standard Mode", the instrument will measure only until a 95% confidence reading of "Positive" or "Negative" has been attained. Measurement time can vary on this mode. In the "K & L Mode" the analyzer displays the complete test information continuously, from the beginning of each reading, including the K-Shell reading with two-sigma confidence intervals, the L-shell reading with two-sigma confidence intervals and the combined reading with two-sigma confidence intervals. The depth index value, which correlates directly with the depth of measurement in inches, is available with both modes of operation. There are no inconclusive ranges or results measured with the XLp 300A. EPM utilized the Niton XLp 300A, serial number 7797, in

the "K and L" mode for the testing performed.

Verification of proper XRF reading capabilities is performed before and after each inspection. A calibration check consists of three consecutive readings of a NIST 1.04 mg/cm2 Paint Film Standard (SRM No. 2573) as required by the instrument's Performance Characteristic Sheet (PCS). The individual readings, and an average of three readings, were recorded and compared to the standards. In all cases the instrument was functioning within the standard deviation as defined by the manufacturer and the PCS. All validation readings were recorded on the field inspection logs. If for any reason the XRF does not pass the quality control procedures, it is EPM's policy to replace that instrument with an XRF that passes the above criteria for calibration. The Results of Calibration Verification is included in Table II.

The parameters used to interpret XRF results are outlined in the HUD Guidelines and the PCS in Appendix F. According to the PCS, each XRF result is classified as positive or negative as follows:

Positive: A positive classification indicates that lead is present on the testing combination at or above the HUD/EPA standard of 1.0 μg/cm^2.

Negative: A negative classification indicates that lead is not present on the testing combination at or above the HUD/EPA standard.

However, for the purposes of this investigation all detectable levels of lead shall be treated as lead containing materials.

The sampling method for this job consisted of a modified HUD inspection. XRF testing was conducted on all accessible materials, with the potential to be impacted by the proposed scope of work at the site.

Table III lists all tested components and their respective locations, substrates, color and XRF result. Components that were identified as containing a detectable level are considered lead containing and are listed in blue. Those components that were identified as containing no detectable lead level are listed in black.

XRF readings listed as "Calibration" are a result of pre and post inspection testing shots of a known NIST standard.

XRF readings listed as "Shutter Calibration" are a result of the XRF device performing an internal calibration check.

3.2 Lead Paint Survey Findings

The results of this inspection indicate that 58.9% of the building surfaces tested contain paint with a detectable level of lead. Of the two hundred and twenty-six (226) readings, one hundred thirty-three (133) had detectable levels of lead. According to the

Occupational Safety and Health Administration (OSHA), any detectable amount of lead in the paint sample constitutes the coating as lead containing. OSHA does not recognize the USEPA definition of lead-based paint (LBP). The lead paint survey at Scarsdale station, determined that the following paints or ceramic tiles contain detectable levels of lead:

Platforms, Stairs and Overpass:

- Brown paint on metal canopy art located on top of the inbound platform;
- Green paint on the metal beams that support the inbound and outbound canopies;
- Black paint on railing associated with the inbound platform;
- Gray paint on the exterior of the Ticket vending machine (TVM) located at the center of the inbound platform;

  Green paint present on the supports for the staircase and canopy associated with the pedestrian overpass;
- Green paint present on the frame of the Communications hut located adjacent to the inbound platform beneath the overpass;
- White paint present on the interior ceiling of the overpass;
- Green paint present on typical salt box located on the platforms;
- Yellow paint present on plastic over concrete tactile warning stirps located on the platforms;
- Light blue paint present on the metal elevator control cabinet and metal housing for oil cabinet in the elevator machine room;
- Gray paint present on the electrical cabinet present in the elevator machine room;
- Dark gray paint present on the pull box present in the elevator machine room;
- Black paint present on the wood backing board present in the elevator machine room.

Station Building and Shelter:

- Brown paint present on wood associated with station building on exterior components of the station building such as wood trim, window frames, window bump out, window sashes, doors, buttresses, roof facia, columns, station roof facia, and oil shed trim;
- Brown paint present on the metal drain upper down spouts of the station building;

- Brown paint present on the interior and exterior of the metal oil shed door;
- Black paint present on the oil tank present in the oil shed;
- Tan paint present on the exterior of the concrete/s tucco walls of the station building and the oil shed;
- White paint present on the wood soffits of the station building;
- Green paint present on the terracotta roof tile present on the st ation building, oil shed roof, platform canopy and canopy overpass;
- White paint present on the concrete parti tion wall located in the cellar of the station building;
- Gray paint present on the concrete floor on the cellar;
- White paint present on the sheet metal ceiling in the cellar;
- White paint present on the metal unction box located in the cellar;
- Black paint present on the metal pipe in the cellar;
- Black paint present on the metal pipe in the attic of the station building;
- White colored cement board material (bot h layers) present on t he ceilings of the corridor, common area, ticket office, and the walls and c eiling of the s tation building;
- White paint present on the wood attic access hatch frame;
- White paint present on the interior wood frame of the ticket office window and the wood slats on the lower part of the east wall inside the station building;
- Light brown paint present on the metal radiator in the ticket office;
- White paint present on the concrete walls of the ticket office;
- White paint present on the gypsum board located in the ticket office;
- Light blue paint present on the wood s lats along the south wall of the boiler room inside the station building;
- Black paint present on the wood cove base a long the perimeter of the concession room;
- Tan paint present on the wood slats located on the ceiling of the conces sion room (above the suspended ceiling panels);
- Light brown ceramic wall tiles present on t he floor in t he men's and wom en's restrooms;
- Tan ceramic floor tiles present in the men's and women's restrooms;
- Beige ceramic floor tile present in the corridor of the station building;
- Light brown paint present on window frame in the men's restroom;
- White paint present on the interior of the windows in the men's and wom en's

restrooms;

- Tan paint present on the window frames located in the interior of the men's and women's restroom;
- Silver paint present on the metal radiators and associated pipes located in the men's and women's restrooms;
- Silver paint present on the metal pipe riser located in the corridor;
- Tan paint present on the wood doors to the men's and women's restrooms;
- White paint present on the wood, concrete and brick walls and the metal pipe inside the janitor's closet;
- Gray paint present on the interior of the window frame in the janitor's closet;
- Tan paint present on the interior of the door and associated frame inside the janitor's closet;
- White paint present on wood wall trim, door frame, window and frame located in the common area of the station building;
- Tan paint present on wood wall trim, interior of wood door, and wood ceiling trim located in the common area;
- White glazed bricks present as the walls of the common area;
- Silver paint present on metal radiator located in the common area;
- Black paint present on the metal screen in front of the fireplace in the common area;
- Black paint present on the metal arm rests on the benches on the common area; and
- Green paint present on the exterior of the wood phone booths located in the common area.

4.0 EXCLUSIONS AND INACCESSIBLE AREAS

EPM inspected and sampled materials which were observable and accessible to the survey team. It is possible that additional suspect ACM or lead paints may be present within other concealed spaces which were not accessible without the use of destructive means. The following suspect materials were inaccessible without destructive testing and therefore assumed present and to containing asbestos:

- Terrazzo flooring underlayment and concrete tile bed located in the common area of the station building (not including corridor);
- Waterproofing beneath ceramic floor tiles and concrete setting bed located in the men's and women's restrooms; and
- Roofing material/tar paper located beneath the terra-cotta roof tiles of the

pedestrian overpass.

All asbestos containing materials and lead-painted surfaces with the potential to be impacted by the scope of work should be abated in accordance with all applicable federal, state and local regulations, including Metro-North Railroad Specifications For The Treatment of Lead-Based Painted Surfaces, 29 CFR 1926.62 Occupational Safety and Health Administration Lead in Construction, USEPA regulations, OSHA regulations, and NIOSH recommendations.

TABLE II - ASBESTOS SAMPLE LABORATORY ANALYTICAL RESULTS

Table II - Asbestos Sample Laboratory Analysis Results
MNR Harlem Line - Scarsdale Station, NY

Sample #	Sample Location	Sample Description	Asbestos Content	
			PLM	TEM
SD-01A	Inbound platform, south end (1W-2W) at joint with stair	Gray caulk	NAD Inconclusive	NAD
SD-01B	Inbound platform, south end (1W-2W) at joint with stair	Gray caulk	NAD Inconclusive	NAD
SD-01C	Inbound platform, south end (1W-2W) at joint with stair	Gray caulk	NAD Inconclusive	Analysis not requested by client
SD-02A	Inbound platform, south end (3W-4W) at joint with stair E2	Blue/dark gray caulk	NAD Inconclusive	NAD
SD-02B	Inbound platform, south end (3W-4W) at joint with stair E2	Blue/dark gray caulk	NAD Inconclusive	NAD
SD-02C	Inbound platform, south end (5W-6W) joint with Ramp E2	Blue/dark gray caulk	NAD Inconclusive	Analysis not requested by client
SD-03A	Inbound platform, south end (3W-4W) at joint with stair E2	Brown joint filler	NAD Inconclusive	NAD
SD-03B	Inbound platform, south end (3W-4W) at joint with stair E2	Brown joint filler	NAD Inconclusive	NAD
SD-03C	Inbound platform, south end (4W-5W) joint with Ramp E2	Brown joint filler	NAD Inconclusive	Analysis not requested by client
SD-04A	Inbound platform, base of column 2W, at platform	Dark gray caulk	NAD Inconclusive	NAD
SD-04B	Inbound platform, base of column 3W, at platform	Dark gray caulk	NAD Inconclusive	NAD
SD-04C	Inbound platform, base of column 4W, at platform	Dark gray caulk	NAD Inconclusive	Analysis not requested by client
SD-05A	Inbound platform, under rubber 1st joint from south	Brown joint filler	NAD Inconclusive	NAD
SD-05B	Inbound platform, under rubber 2nd joint from south	Brown joint filler	NAD Inconclusive	NAD
SD-05C	Inbound platform, under rubber 3rd joint from south	Brown joint filler	NAD Inconclusive	Analysis not requested by client
SD-06A	Inbound Platform, south end of south canopy (1W-2W)	Brown rigid roof insulation	NAD	
SD-06B	Inbound platform, south end of north canopy (17W)	Brown rigid roof insulation	NAD	
SD-06C	Outbound platform, north end of canopy (19E-20E)	Brown rigid roof insulation	NAD	

Table II - Asbestos Sample Laboratory Analysis Results
MNR Harlem Line - Scarsdale Station, NY

Sample #	Sample Location	Sample Description	Asbestos Content	
			PLM	TEM
SD-07A	Inbound Platform, south end of south canopy (1W-2W)	Black perimeter roof flashing tar	NAD Inconclusive	NAD
SD-07B	Inbound platform, south end of north canopy (17W)	Black perimeter roof flashing tar	NAD Inconclusive	NAD
SD-07C	Outbound platform, north end of canopy (19E-20E)	Black perimeter roof flashing tar	NAD Inconclusive	Analysis not requested by client
SD-08A	Inbound platform, south end of north canopy (17W)	Brown rigid roof insulation	NAD	
SD-08B	Inbound platform, south end of north canopy (17W)	Brown rigid roof insulation	NAD	
SD-08C	Outbound platform, north end of canopy (19E-20E)	Brown rigid roof insulation	NAD	
SD-09A	Inbound platform, center (7W-8W) at joint with stair E3	Black mastic/tar sealant	NAD Inconclusive	NAD
SD-09B	Inbound platform, center (7W-8W) at joint with stair E3	Black mastic/tar sealant	NAD Inconclusive	NAD
SD-09C	Inbound platform, center (7W-8W) at joint with stair E3	Black mastic/tar sealant	NAD Inconclusive	Analysis not requested by client
SD-10A	Inbound platform, base of light pole at 8W	Gray caulk	NAD Inconclusive	NAD
SD-10B	Inbound platform, base of light pole at 10W	Gray caulk	NAD Inconclusive	NAD
SD-10C	Outbound platform, base of light pole at 5E	Gray caulk	NAD Inconclusive	Analysis not requested by client
SD-11A	Inbound platform, expansion joint at stair E4	Light gray caulk	NAD Inconclusive	NAD
SD-11B	Outbound platform, expansion joint at 12E	Light gray caulk	NAD Inconclusive	NAD
SD-11C	Inbound platform, expansion joint at stair E4	Light gray caulk	NAD Inconclusive	Analysis not requested by client
SD-12A	Inbound platform, around drainage at underside of canopy (5W)	Light gray caulk	NAD Inconclusive	NAD
SD-12B	Inbound platform, around drainage at underside of canopy (18W)	Light gray caulk	NAD Inconclusive	NAD
SD-12C	Outbound platform, around drainage at underside of canopy (13E)	Light gray caulk	NAD Inconclusive	Analysis not requested by client

Table II - Asbestos Sample Laboratory Analysis Results
MNR Harlem Line - Scarsdale Station, NY

Sample #	Sample Location	Sample Description	Asbestos Content	
			PLM	TEM
SD-13A	Outbound platform, platform joint with stair btwn 5E-6E	Dark gray caulk	NAD Inconclusive	NAD
SD-13B	Outbound platform, platform joint with stair btwn 5E-6E	Dark gray caulk	NAD Inconclusive	NAD
SD-13C	Outbound platform, platform joint with stair btwn 5E-6E	Dark gray caulk	NAD Inconclusive	Analysis not requested by client
SD-14A	Station building- perimeter of stucco panels - West-NW side	White caulk	NAD Inconclusive	NAD
SD-14B	Station building- perimeter of stucco panels - North side	White caulk	NAD Inconclusive	NAD
SD-14C	Station building - perimeter of stucco panels- Southeast corner	White caulk	NAD Inconclusive	Analysis not requested by client
SD-15A	Station building - W-southwest elevation panel	White/gray stucco material	NAD	
SD-15B	Station building - East-southeast elevation panel	White/gray stucco material	NAD	
SD-15C	Station building - West elevation, south of Gen. Building	White/gray stucco material	NAD	
SD-16A	Station building - Window sash - west-southwest (exterior)	White putty		Trace ANTH
SD-16B	Station building - Window sash - west-northwest (exterior)	White putty		Trace ANTH
SD-16C	Station building - Window sash - west-southeast (exterior)	White putty		Analysis not requested by client
SD-17A	Station building - drain pipe connection SW corner	Gray caulk	NAD Inconclusive	NAD
SD-17B	Station building - drain pipe connection, west side	Gray caulk	NAD Inconclusive	NAD
SD-17C	Station building - drain pipe connection ,south - southeast corner	Gray caulk	NAD Inconclusive	Analysis not requested by client
SD-18A	Station building - drain pipe connection, east-southeast corner	Black caulk	NAD Inconclusive	NAD
SD-18B	Station building - drain pipe connection, east southeast corner	Black caulk	NAD Inconclusive	NAD
SD-18C	Station building - drain pipe connection ,west-northwest corner	Black caulk	NAD Inconclusive	Analysis not requested by client

Table II - Asbestos Sample Laboratory Analysis Results
MNR Harlem Line - Scarsdale Station, NY

Sample #	Sample Location	Sample Description	Asbestos Content	
			PLM	TEM
SD-19A	Generator exhaust conduit penetration at shelter	Light Gray caulk	NAD Inconclusive	NAD
SD-19B			NAD Inconclusive	NAD
SD-19C			NAD Inconclusive	Analysis not requested by client
SD-20A	Terra-Cotta tiles canopy northeast corner of building	Black with white dots insulation material	NAD Inconclusive	NAD
SD-20B	Terra-Cotta roof joint between shelter roof and building wall	Black with white dots insulation material	NAD Inconclusive	NAD
SD-20C	Terra-Cotta canopy northeast corner of building	Black with white dots insulation material	NAD Inconclusive	Analysis not requested by client
SD-21A	Beneath Terra-Cotta tiles and roof - NE corner	Tar paper material	NAD Inconclusive	NAD
SD-21B	Beneath Terra-Cotta tiles and roof - NE corner	Tar paper material	NAD Inconclusive	NAD
SD-21C	Beneath Terra-Cotta tiles and roof - beyond the station building	Tar paper material	NAD Inconclusive	Analysis not requested by client
SD-22A	Station building interior: Ticket office -bottom layer	Beige floor tile with yellow blue (inseparable)	NAD Inconclusive	NAD
SD-22B			NAD Inconclusive	NAD
SD-22C			NAD Inconclusive	Analysis not requested by client
SD-23A	Station building interior: Ticket office -bottom layer	12" x 12" Brown floor tile with brown specs (with glue inseparable)	NAD Inconclusive	NAD
SD-23B			NAD Inconclusive	NAD
SD-23C			NAD Inconclusive	Analysis not requested by client
SD-24A	Station building interior Ticket office east wall	Gray concrete/plaster board	NAD	
SD-24B		Gray concrete/plaster board	NAD	
SD-24C		Gray concrete/plaster board	NAD	

Table II - Asbestos Sample Laboratory Analysis Results
MNR Harlem Line - Scarsdale Station, NY

Sample #	Sample Location	Sample Description	Asbestos Content	
			PLM	TEM
SD-25A	Station building interior: Boiler Room, east wall	Gypsum board	NAD	
SD-25B	Station building interior: Boiler Room, east wall	Gypsum board	NAD	
SD-25C	Station building interior: Boiler Room, south wall	Gypsum board	NAD	
SD-26A.1	Station building interior: Boiler Room, east wall	Joint compound/tape	NAD	
SD-26B.1	Station building interior: Boiler Room, east wall	Joint compound/tape	NAD	
SD-26C.1	Station building interior: Boiler Room, south wall	Joint compound/tape	NAD	
SD-26A.2	Station building interior: Boiler Room, east wall	Gypsum board tape	NAD	
SD-26B.2	Station building interior: Boiler Room, east wall	Gypsum board tape	NAD	
SD-26C.2	Station building interior: Boiler Room, south wall	Gypsum board tape	NAD	
SD-27A	Station building interior: Boiler Room, east side	12" x 12" Beige floor tile with glue (inseparable)	NAD Inconclusive	NAD
SD-27B	Station building interior: Boiler Room, west side	12" x 12" Beige floor tile with glue (inseparable)	NAD Inconclusive	NAD
SD-27C	Station building interior: Boiler Room, west side	12" x 12" Beige floor tile with glue (inseparable)	NAD Inconclusive	Analysis not requested by client
SD-28A.1	Station building interior: Corridor threshold between boiler room (beneath 5/8" plywood and ceramic floor tiles	Black mastic	NAD Inconclusive	NAD
SD-28A.2		Green Floor tile	NAD Inconclusive	NAD
SD-28B.1		Black Mastic	NAD Inconclusive	NAD
SD-28B.2		Green Floor tile	NAD Inconclusive	NAD
SD-28C.1		Black Mastic	NAD Inconclusive	Analysis not requested by client
SD-28C.2		Green Floor tile	NAD Inconclusive	Analysis not requested by client

Table II - Asbestos Sample Laboratory Analysis Results
MNR Harlem Line - Scarsdale Station, NY

Sample #	Sample Location	Sample Description	Asbestos Content	
			PLM	TEM
SD-29A	Station building interior: corridor boiler room threshold	Floor tile - mortar	NAD	
SD-29B		Floor tile - mortar	NAD	
SD-29C		Floor tile - mortar	NAD	
SD-30A	Station building interior: corridor boiler room threshold	Floor tile - grout	NAD	
SD-30B		Floor tile - grout	NAD	
SD-30C		Floor tile - grout	NAD	
SD-31A	Station Pedestrian overpass canopy (at staircase): beneath Terra-cotta tiles (openings)	Green mortar	NAD	
SD-31B		Green mortar	NAD	
SD-31C		Green mortar	NAD	
SD-32A	Pedestrian Overpass Canopy: Beneath Terra-Cotta tiles - outbound side	Tar paper material	NAD Inconclusive	NAD
SD-32B		Tar paper material	NAD Inconclusive	NAD
SD-32C		Tar paper material	NAD Inconclusive	Analysis not requested by client
SD-33A	Station building interior: Concession Room ceiling - center	2' x 2' suspended Gypsum ceiling panel	NAD	
SD-33B	Station building interior: Concession Room ceiling - center		NAD	
SD-33C	Station building interior: Concession Room ceiling - SW		NAD	
SD-34A	Station building interior: Cellar ceiling near north wall	Gypsum board material	NAD	
SD-34B	Station building interior: Cellar ceiling near east wall		NAD	
SD-34C	Station building interior: Cellar ceiling near west wall		NAD	
SD-35A	Oil room shelter door	Brown paper door insulation	NAD	
SD-35B	Door between ticket office and boiler room		NAD	
SD-35C	Boiler Room door		NAD	

Table II - Asbestos Sample Laboratory Analysis Results
MNR Harlem Line - Scarsdale Station, NY

Sample #	Sample Location	Sample Description	Asbestos Content	
			PLM	TEM
SD-36A	Elevator Machine Room backing inside relay cabinet	Black backing board material	NAD Inconclusive	NAD
SD-36B			NAD Inconclusive	NAD
SD-36C			NAD Inconclusive	Analysis not requested by client
SD-37A	Attic space, ceiling above corridor	Light gray plaster ceiling	NAD	
SD-37B	Attic space, ceiling above corridor		NAD	
SD-37C	Attic space, ceiling above corridor		NAD	
SD-37D	Attic space, above ticket office		NAD	
SD-37E	Attic space, above men's room		NAD	
SD-38A	Concession room: flooring east side near door	12" x 12" black floor tile and adhesive (inseparable)	NAD Inconclusive	NAD
SD-38B	Concession room: flooring southeast corner near closet		NAD Inconclusive	NAD
SD-38C	Concession room: flooring center south		NAD Inconclusive	Analysis not requested by client
SD-39A.1	Concession room: house wiring inside ceiling j-box	Braided wire insulation (outer insulation)	NAD	
SD-39A.2		Braided wire insulation (inner core)	NAD Inconclusive	NAD
SD-39B.1		Braided wire insulation (outer insulation)	NAD	
SD-39B.2		Braided wire insulation (inner core)	NAD Inconclusive	NAD
SD-39C.1		Braided wire insulation (outer insulation)	NAD	
SD-39C.2		Braided wire insulation (inner core)	NAD Inconclusive	Analysis not requested by client

Table II - Asbestos Sample Laboratory Analysis Results
MNR Harlem Line - Scarsdale Station, NY

Sample #	Sample Location	Sample Description	Asbestos Content	
			PLM	TEM
SD-40A	Corridor: near attic access hatch	Cement board material	NAD	
SD-40B			NAD	
SD-40C			NAD	
SD-41A.1	Woman's restroom: wall joint	Joint compound	NAD	
SD-41A.2	Woman's restroom: wall joint	Tape	NAD	
SD-41B.1	Concession room wall joint	Joint compound	NAD	
SD-41B.2	Concession room wall joint	Tape	NAD	
SD-41C.1	Corridor wall joint	Joint compound	NAD	
SD-41C.2	Corridor wall joint	Tape	NAD	
SD-42A	Concession room wall	Gypsum board material - white	NAD	
SD-42B	Janitor's closet wall		NAD	
SD-42C	Concession room wall		NAD	
SD-43A	Men's room wall	Gypsum board material - gray	NAD	
SD-43B	Women's room wall		NAD	
SD-43C	Men's room wall		NAD	
SD-44A	Men's restroom ceramic floor tile	Floor tile - Mortar	NAD	
SD-44B	Woman's restroom: ceramic floor tile		NAD	
SD-44C	Men's restroom ceramic floor tile		NAD	

Table II - Asbestos Sample Laboratory Analysis Results
MNR Harlem Line - Scarsdale Station, NY

Sample #	Sample Location	Sample Description	Asbestos Content	
			PLM	TEM
SD-45A	Men's restroom ceramic floor tile	Floor tile - grout	NAD	
SD-45B	Woman's restroom: ceramic floor tile		NAD	
SD-45C	Men's restroom ceramic floor tile		NAD	
SD-46A	Men's restroom 4" x 4" ceramic wall tiles	Wall tile mortar	NAD	
SD-46B			NAD	
SD-46C			NAD	
SD-47A	Men's restroom ceramic wall tile	Wall tile grout	NAD	
SD-47B	Woman's restroom: ceramic wall tile		NAD	
SD-47C	Men's restroom ceramic wall tile		NAD	
SD-48A	Women's restroom: sink joint	White caulk	NAD Inconclusive	Trace CH
SD-48B	Women's restroom: toilet joint		NAD Inconclusive	Trace CH
SD-48C	Men's restroom: Urinal joint		NAD Inconclusive	Analysis not requested by client
SD-49A	Common area: terrazzo flooring - east side near door	Terrazzo flooring material	NAD	
SD-49B	Common area: terrazzo flooring - east side near door		NAD	
SD-49C	Common area: terrazzo flooring - westside near phone booth		NAD	

Table II - Asbestos Sample Laboratory Analysis Results
MNR Harlem Line - Scarsdale Station, NY

Sample #	Sample Location	Sample Description	Asbestos Content	
			PLM	TEM
SD-50A	Common area: ceramic wall tile joint and backing near phone booths	Grout- gray	NAD	
SD-50B			NAD	
SD-50C			NAD	
SD-51A	1" square ceramic floor tile boarder perimeter pattern - entrance	Grout- dark gray	NAD	
SD-51B	1" square ceramic floor tile boarder perimeter pattern - near booth		NAD	
SD-51C	1" square ceramic floor tile boarder perimeter pattern - near corridor		NAD	

NAD = No Asbestos Detected
NA/PS = Not Analyzed/Positive Stop
CH = Chrysotile Asbestos
Trace CH = < 1%
ANTH = Anthophylilite
Trace ANTH = <1%

TABLE III – XRF INSPECTION RESULTS

Table III - Results from XRF Testing for Lead
MNR Harlem Line - Scarsdale Station, 1 Depot Place, Scarsdale, NY

Reading No	Room/ Area	Component	Color	Substrate	PbC $\mu g/cm^2$
475	CALIBRATION				1.1
476	CALIBRATION				1.2
477	CALIBRATION				1.1
478	Inbound Platform	Telephone box	Green	Metal	0
479	Inbound Platform	Railing	Black	Metal	0
480	Inbound Platform	Structural Column	Green	Metal	-0.07
481	Inbound Platform	Station Sign	White	Metal	0
482	Inbound Platform	Station Sign	Blue	Metal	0
483	Inbound Platform	Station Sign	Black	Metal	0
484	Inbound Platform	Bench	Black	Metal	0
485	Inbound Platform	"Watch the Gap" Sign	Yellow	Concrete	0
486	Inbound Platform	Tactile Strip	Yellow	Plastic over Concrete	0
487	Inbound Platform	Sign (exit)	White	Metal	0
488	Inbound Platform	Sign (exit)	Black	Metal	0
489	Inbound Platform	Sign (exit)	Red	Metal	0
490	Inbound Platform - south	Canopy Fascia	Brown	Metal	0
491	Inbound Platform - south	Canopy ART	Brown	Metal	0.01
492	Inbound Platform - south	Canopy ART	Brown	Metal	0
493	Inbound Platform - south	Canopy ART	Brown	Metal	0.02
494	Inbound Platform - south	Canopy Lights	Brown	Metal	0.02
495	Inbound Platform - south	Lights beneath canopy	Silver	Metal	0
496	Inbound Platform - south	Schedule panel	Black	Metal	0
497	NULL				7.39
498	Inbound North End	Canopy Fascia	Brown	Metal	0
499	Inbound North End	Canopy Art	Brown	Metal	0.01
500	Inbound Platform	Tactile strip	Yellow	Plastic over Concrete	0
501	Outbound Platform	Canopy Fascia	Brown	Metal	0
502	Outbound Platform	Tactile strip	Yellow	Plastic over Concrete	0
215	SHUTTER_CALIBRATION				0
216	CALIBRATION				0
217	CALIBRATION				0.24
218	CALIBRATION				0
219	Inbound Platform - south	Schedule sign frame	Black	Metal	0

Table III - Results from XRF Testing for Lead
MNR Harlem Line - Scarsdale Station, 1 Depot Place, Scarsdale, NY

Reading No	Room/ Area	Component	Color	Substrate	PbC $\mu g/cm^2$
220	Inbound Platform - south	South Stairs - Railing	Black	Metal	0
221	Inbound - South station	Sign	White	Plastic	0
222	Inbound - South station	Trash bin	Green	Metal	0
223	Inbound platform	Shelter frame	Brown	Metal	0
224	Inbound Canopy -south	Support	Green	Metal	0.14
225	Inbound Platform - south	Railing	Black	Metal	0.2
226	NULL				0
227	Inbound Platform - south	Shelter frame	Black	Metal	0
228	Center Inbound side	Ticket Vending Machine (TVM) exterior	Gray	Metal	0.01
229	Center Inbound side	TVM	Blue	Metal	0
230	Inbound platform -Center	Lightpost	Green	Metal	0
231	CALIBRATION				5.55
232	NULL				0.04
233	Inbound platform	Stairs to overpass - support	Green	Metal	0.06
234	Inbound	Stairs to overpass - support	Green	Metal	0.3
235	Adj. to Inbound Platform	Communications hut frame	Green	Metal	0.16
236	Inbound Platform -North	Salt Box	Green	Wood	0.01
237	Inbound Platform -North	Trash bin	Green	Metal	0
238	Inbound Platform -North	Bench	Black	Metal	0
239	Inbound Platform -North Canopy	Horizontal beam	Green	Metal	-0.04
240	Inbound - North Platform	Railing	Black	Metal	0
241	Inbound - North Platform	Light post	Green	Metal	0
242	Inbound - North Platform	Tactile strip	Yellow	Plastic over Concrete	0
243	Inbound - North Platform	Railing	Black	Metal	0
244	Pedestrian Overpass	West window frame	Black	Metal	0

Table III - Results from XRF Testing for Lead
MNR Harlem Line - Scarsdale Station, 1 Depot Place, Scarsdale, NY

Reading No	Room/ Area	Component	Color	Substrate	PbC $\mu g/cm^2$
245	Outbound Platform - south	Light pole	Green	Metal	0
246	Outbound South Station	Sign	White	Plastic	0
247	Outbound South station	Railing	Black	Metal	0
248	Outbound South station	Bench	Black	Metal	0
249	Outbound -South Canopy	Support column	Green	Metal	0.19
250	Outbound -South Canopy	Support column	Green	Metal	0.5
251	Outbound South station	Shelter frame	Black	Metal	0
252	South platform	Stair tread	Yellow	Concrete	0
253	Outbound Platform-Center	Recycling Receptacle	Green	Metal	0
254	Outbound-Center Platform	"Watch the Gap" Paint	Yellow	Concrete	0
255	Outbound-Center Platform	Salt Box	Green	Wood	0.01
256	Outbound-Center Platform	Railing	Black	Metal	0
257	Outbound-North Platform	Light post	Green	Metal	0
258	Outbound-North Platform	Railing	Black	Metal	0
259	Outbound-North Platform	Tactile Strip-paint	Yellow	Plastic over Concrete	0
260	Parking lot -Lane space North lot	Striping-paint	White	Asphalt	0
261	West of Inbound platform	Bicycle rack	Black	Metal	0
262	West Parking lot	Bollard	Yellow	Metal	0
263	CALIBRATION				1
264	CALIBRATION				1
265	CALIBRATION				1
320	SHUTTER_CALIBRATION				5.25
321	CALIBRATION				1
322	CALIBRATION				1
323	CALIBRATION				1
324	Building South elevation	Horizontal wood trim	Brown	Wood	0.04
325	NULL				0.28
326	Building South elevation	Window frame	Brown	Wood	0.01
327	Building South elevation	Upper down spout	Brown	Metal	15.6
328	Building South elevation	Lower down spout	Brown	Metal	0
329	Building east elevation	South door	Brown	Wood	0.01

Table III - Results from XRF Testing for Lead
MNR Harlem Line - Scarsdale Station, 1 Depot Place, Scarsdale, NY

Reading No	Room/ Area	Component	Color	Substrate	PbC $\mu g/cm^2$
330	Building east elevation	Window bump out	Brown	Wood	16.2
331	Building east elevation	Horizontal trim	Brown	Wood	0.08
332	Building east elevation	Exterior wall	Tan	Concrete/ Stucco	0.02
333	Building east elevation	South Buttress	Brown	Wood	0.4
334	Building east elevation	Fascia	Brown	Wood	0.01
335	East roof	Roof tiles	Green	Terra-cotta	46.4
336	East roof	Roof tiles	Green	Terra-cotta	22.9
337	East soffit	Soffit	White	Wood	0.02
338	NULL				0
339	East soffit	Soffit	White	Wood	0
340	North roof ext.	North column	Brown	Wood	0.3
341	North elevation	Vertical trim	Brown	Wood	0.5
342	North elevation	Wall	Tan	Concrete/ Stucco	0.02
343	West Elevation	Oil tank shed roof	Green	Terra-cotta	31.4
344	West Elevation	Roof fascia	Brown	Wood	0.02
345	West Elevation	Soffit	White	Wood	0
346	West Elevation	Upper down spout	Brown	Metal	32.1
347	West Elevation	Oil tank shed wall	Tan	Concrete	0
348	West Elevation	Oil tank shed door	Brown	Metal	0.03
349	West Elevation	Oil tank shed trim	Brown	Wood	0.01
350	Interior Ticket office	East window frame	White	Wood	0.6
351	Interior Ticket office	E. So. Wall	White	Concrete	43.9
352	Interior Ticket office	E. So. Wall	White	Concrete	44.4
353	Interior Ticket office	Floor	Red	Wood	0
354	Interior Ticket office	Radiator	Light brown	Metal	1
355	Interior Ticket office	Entry door	White	Wood	0
356	Interior Ticket office	West wall	White	Gypsum board	0.18
357	Interior Ticket office	Interior door	Gray	Metal	0
358	Interior Ticket office	East wall - lower slat board	White	Wood	0.8
359	Boiler	West wall - slat board	Light blue	Wood	0.8
360	Interior boiler room	South wall	White	Gypsum board	0
361	Interior Hut	Door frame	Light brown	Metal	0
362	Spice Cabinet	Cabinet	Green	Metal	0
363	Interior Concession	Ceiling	Tan	Wood	11.8
364	Interior Concession	East wall - lower slat board	Brown	Gypsum board	0
365	Interior Concession	West wall	Tan	Gypsum board	0
366	Interior Concession	West wall	Black	Gypsum board	0
367	Interior Concession	Cove base	Black	Wood	0.01
368	West elevation, Women's bathroom	Window	Brown	Wood	39.7

Table III - Results from XRF Testing for Lead
MNR Harlem Line - Scarsdale Station, 1 Depot Place, Scarsdale, NY

Reading No	Room/ Area	Component	Color	Substrate	PbC $\mu g/cm^2$
369	South elevation, Entry door	Door frame	Brown	Wood	0.01
370	Stair Canopy	Roof	Green	Terra-cotta	0.01
371	Stair Canopy	Fascia	White	Wood	0
372	Platform	Tactile Warning Strip	Yellow	Plastic over Concrete	1.4
373	CALIBRATION				1
374	CALIBRATION				1.4
375	CALIBRATION				1
1	SHUTTER_CALIBRATION				5.6
2	CALIBRATION				1
3	CALIBRATION				1.1
4	CALIBRATION				0.9
5	Tank room	Oil tank	Black	Metal	0.01
6	Tank room	Oil tank	Black	Metal	0.04
7	Tank room	Oil tank	Black	Metal	0.02
8	Tank room	Oil tank	Black	Metal	-0.25
9	Tank room	Oil tank	Black	Metal	0.01
10	Tank room	Door interior side	Brown	Metal	0
11	Tank room	Door frame interior side	Brown	Metal	0.01
12	Elevator Machine room	Control cabinet	Light blue	Metal	-0.01
13	Elevator Machine room	Control cabinet	Light blue	Metal	0.04
14	Elevator Machine room	Control cabinet	Light blue	Metal	0.02
15	Elevator Machine room	Electrical cabinet	Gray	Metal	0.03
16	Elevator Machine room	Housing for oil	Light blue	Metal	0.17
17	Elevator Machine room	Pull box	Dark gray	Metal	0.01
18	Elevator Machine room	Back board	Black	Wood	0.01
19	Elevator Machine room	Door interior side	Brown	Metal	0
20	Elevator Machine room	Door frame interior side	Brown	Metal	0
21	Elevator Machine room	Door exterior side	Green	Metal	0
22	Elevator Machine room	Door frame exterior side	Green	Metal	0
23	Attic over overpass	Electrical box	Gray	Metal	0
24	Overpass	Ceiling	White	Wood	0.01
25	Cellar	Wall, west	White	Concrete	0
26	Cellar	Wall, south	White	Concrete	0
27	Cellar	Wall, east	White	Concrete	0
28	Cellar	Wall, east	White	Concrete	0
29	Cellar	Wall, east	White	Concrete	0
30	Cellar	Wall, north	White	Concrete	0
31	Cellar	Wall, interior partition	White	Concrete	0.13
32	Cellar	Pipe	Red	Metal	0

Table III - Results from XRF Testing for Lead
MNR Harlem Line - Scarsdale Station, 1 Depot Place, Scarsdale, NY

Reading No	Room/ Area	Component	Color	Substrate	PbC $\mu g/cm^2$
33	Cellar	Ceiling	White	Metal	0.24
34	Cellar	Ceiling	White	Metal	0.17
35	Cellar	Floor	Gray	Concrete	0.03
36	Cellar	Pipe	Black	Metal	0.06
37	Cellar	Pipe	Black	Metal	0.06
38	Cellar	Conduit	White	Metal	0
39	Cellar	Conduit	White	Metal	0
40	Cellar	Junction box	White	Metal	0.02
41	Cellar	Ceiling	White	Gypsum board	0
42	Attic	Pipe	Black	Metal	0.01
43	Corridor	Ceiling	White	Cement board	38.1
44	Corridor	Ceiling	White	Cement board	39.2
45	Corridor	Ceiling	White	Cement board	36.2
46	Corridor	Ceiling	White	Cement board	33.5
47	Corridor	Ceiling	White	Cement board	33.4
48	Corridor	Ceiling	White	Cement board	0
49	Corridor	Ceiling	White	Cement board	36.2
50	Corridor	Ceiling	White	Cement board	36.7
51	Corridor	Ceiling	White	Cement board	37.8
52	Corridor	Ceiling	White	Cement board	39.6
53	Corridor	Ceiling	White	Cement board	38.4
54	Corridor	Ceiling	White	Cement board	40.9
55	Corridor	Hatch frame	White	Wood	0.01
56	Corridor	Hatch frame	White	Wood	0.01
57	Corridor	Hatch frame	White	Wood	0.01
58	Corridor	Hatch frame	White	Wood	0.02
59	Women's bathroom	Wall, west	Tan	Ceramic	0
60	Women's bathroom	Wall, west	Light brown	Ceramic	0.6
61	Women's bathroom	Wall, south	Tan	Gypsum board	0
62	Women's bathroom	Wall, south	Tan	Gypsum board	0
63	Women's bathroom	Wall, south	Tan	Gypsum board	0
64	Women's bathroom	Wall, south	Light brown	Ceramic	0.5
65	Women's bathroom	Window frame	Tan	Wood	0.01
66	Women's bathroom	Window	White	Wood	23.1
67	Women's bathroom	Window	White	Wood	20.1
68	Women's bathroom	Door, interior	Tan	Wood	0.02
69	Women's bathroom	Door frame	Tan	Wood	0.01
70	Women's bathroom	Radiator	Silver	Metal	0.14
71	Women's bathroom	Radiator	Silver	Metal	0.16
72	Women's bathroom	Floor	Tan	Ceramic	0.01
73	Janitor's Closet	Window frame	Gray	Wood	4.5
74	Janitor's Closet	Wall, west upper	White	Wood	15.5
75	Janitor's Closet	Wall, west lower	White	Concrete	0.04
76	Janitor's Closet	Wall, south	White	Wood	13.3

Table III - Results from XRF Testing for Lead
MNR Harlem Line - Scarsdale Station, 1 Depot Place, Scarsdale, NY

Reading No	Room/ Area	Component	Color	Substrate	PbC $\mu g/cm^2$
77	Janitor's Closet	Wall, south	White	Brick	7.7
78	Janitor's Closet	Pipe	White	Metal	12.8
79	Janitor's Closet	Door	Tan	Wood	0.26
80	Janitor's Closet	Door frame	Tan	Wood	0.5
81	Men's bathroom	Wall, east	Tan	Gypsum board	0
82	Men's bathroom	Wall, east	Light brown	Ceramic	0.6
83	Men's bathroom	Wall, west	Tan	Gypsum board	0
84	Men's bathroom	Wall, west	Light brown	Ceramic	0.5
85	Men's bathroom	Window frame	Tan	Wood	0.01
86	Men's bathroom	Window	White	Wood	22.6
87	Men's bathroom	Window side	Light brown	Wood	19.3
88	Men's bathroom	Radiator	Silver	Metal	0.03
89	Men's bathroom	Radiator	Silver	Metal	0.01
90	Men's bathroom	Pipe	Silver	Metal	0.16
91	Men's bathroom	Floor	Tan	Ceramic	0.02
92	Men's bathroom	Door	Tan	Wood	0.01
93	Men's bathroom	Door frame	Tan	Wood	0
94	Corridor	Pipe	Silver	Metal	0.5
95	Corridor	Floor	Beige	Ceramic	0.02
96	Common Area	Door	Tan	Wood	0
97	Common Area	Door	Tan	Wood	0
98	Common Area	Door frame	White	Wood	0.01
99	Common Area	Window frame	White	Wood	0.3
100	Common Area	Window	White	Wood	1.7
101	Common Area	Trim on wall	Tan	Wood	1.3
102	Common Area	Wall, south	white	Glazed brick	2
103	Common Area	Wll trim, east	Tan	Wood	1.3
104	Common Area	Wll trim, east	White	Wood	1
105	Common Area	Wll trim, east	White	Wood	1.1
106	Common Area	Wall, east	white	Glazed brick	0.4
107	Common Area	Wall, west	white	Glazed brick	0.5
108	Common Area	Radiator	Silver	Metal	0.08
109	Common Area	Fireplace screen	Black	Metal	0.02
110	Common Area	Arm rest	Black	Metal	0.4
111	Common Area	Phone booth	Green	Wood	0.01
112	Common Area	Ceiling	White	Cement board	39.2
113	Common Area	Ceiling	White	Cement board	38.9
114	Common Area	Beam	Tan	Wood	0.6
115	Common Area	Door	Tan	Wood	0.01
116	Common Area	Door frame	White	Wood	0
117	Common Area	Window	White	Wood	1.7
118	Common Area	Window frame	White	Wood	1
119	Common Area	Trim on wall	Tan	Wood	1.4

Table III - Results from XRF Testing for Lead
MNR Harlem Line - Scarsdale Station, 1 Depot Place, Scarsdale, NY

Reading No	Room/ Area	Component	Color	Substrate	PbC $\mu g/cm^2$
120	CALIBRATION				1
121	CALIBRATION				1
122	CALIBRATION				1.4
123	CALIBRATION				1
124	CALIBRATION				1
125	CALIBRATION				1

APPENDIX A
Representative Survey Photographs of Presumed Asbestos-Containing Materials and Lead Paints

Photographs of Presumed Asbestos-Containing Materials

Environmental Planning & Management, Inc.
www.epmco.com

Photographs of Presumed Asbestos-Containing Materials

LOCATION: MNR SCARSDALE STATION

1 Depot Place, Scarsdale, NY

DATE: September, 2018

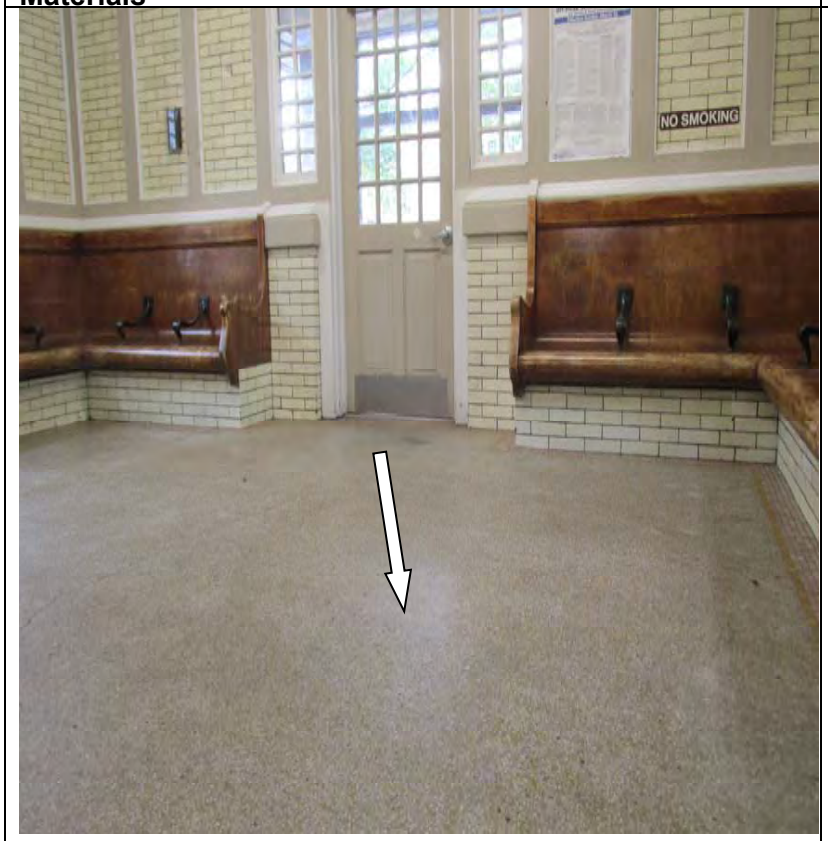


Photo No. 1

Location: Station Building – Common Area
Description: Presumed ACM waterproofing beneath terrazzo flooring and concrete bed.

Photo No. 2

Location: Station Building - Men's Restroom
Description: Presumed ACM waterproofing material beneath ceramic floor tiles and tile setting/concrete bed.

Environmental Planning & Management, Inc.
www.epmco.com

Photographs of Presumed Asbestos-Containing Materials

LOCATION: MNR SCARSDALE STATION

1 Depot Place, Scarsdale, NY

DATE: September, 2018

Photo No. 3

Location: Station Building - Women's Restroom
Description: Presumed ACM waterproofing material beneath ceramic floor tiles and tile setting/concrete bed.

Photo No. 4

Location: Pedestrian Overpass Canopy Roof
Description: Presumed ACM roofing material beneath terra-cotta tiles.

Photographs of Lead-Containing Paints

Environmental Planning & Management, Inc.
www.epmco.com

Lead Paint Survey Photographs

LOCATION: MNR SCARSDALE STATION

MNR Harlem Line – Scarsdale, NY

DATE: September, 2018

Photo No. 1

Location: Inbound Platform - south
Description: Lead containing brown paint on metal Canopy ART (8/15/18 Reading Nos. 491, 493 & 499).

Photo No. 2

Location: Inbound Platform - south
Description: Lead containing brown paint on metal canopy lights (8/15/18 Reading No. 494).

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 3		**Photo No. 4**
Location: Inbound Canopy -south **Description:** Lead containing green paint on metal support beams (8/16/18 Reading No. 224).		**Location:** Inbound Platform - south **Description:** Lead containing black paint on metal railing (8/16/18 Reading No. 225).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 5		**Photo No. 6**
Location: Center Inbound side **Description:** Lead containing gray paint on metal vending machine (8/16/18 Reading No. 228).		**Location:** Inbound Platform – stairs to overpass **Description:** Lead containing green paint on metal support beams (8/16/18 Reading No. 233 & 234).	

Environmental Planning & Management, Inc.
www.epmco.com

Lead Paint Survey Photographs

LOCATION: MNR SCARSDALE STATION

MNR Harlem Line – Scarsdale, NY

DATE: September, 2018

Photo No. 7

Location: Adjacent to Inbound Platform
Description: Lead containing green paint on metal Communications hut frame (8/16/18 Reading No. 235).

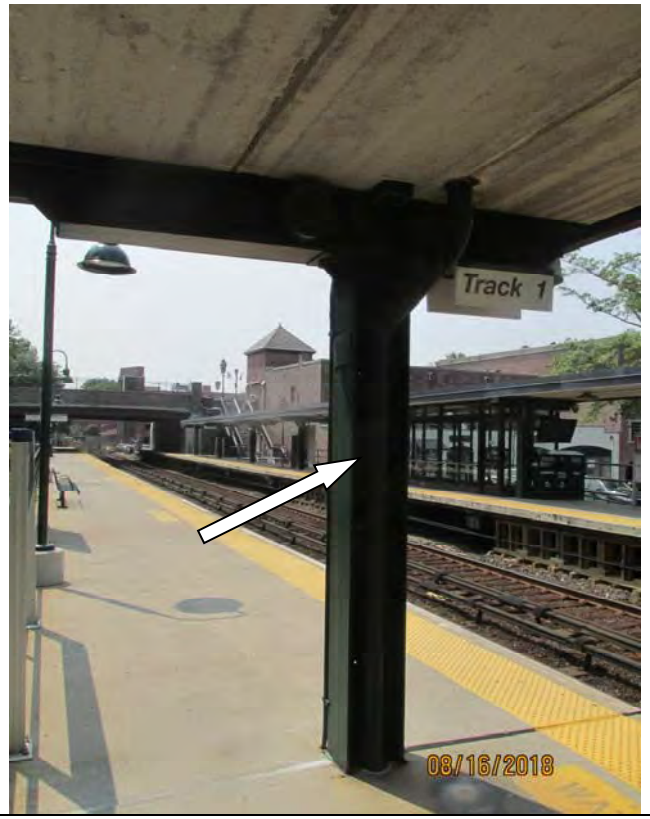
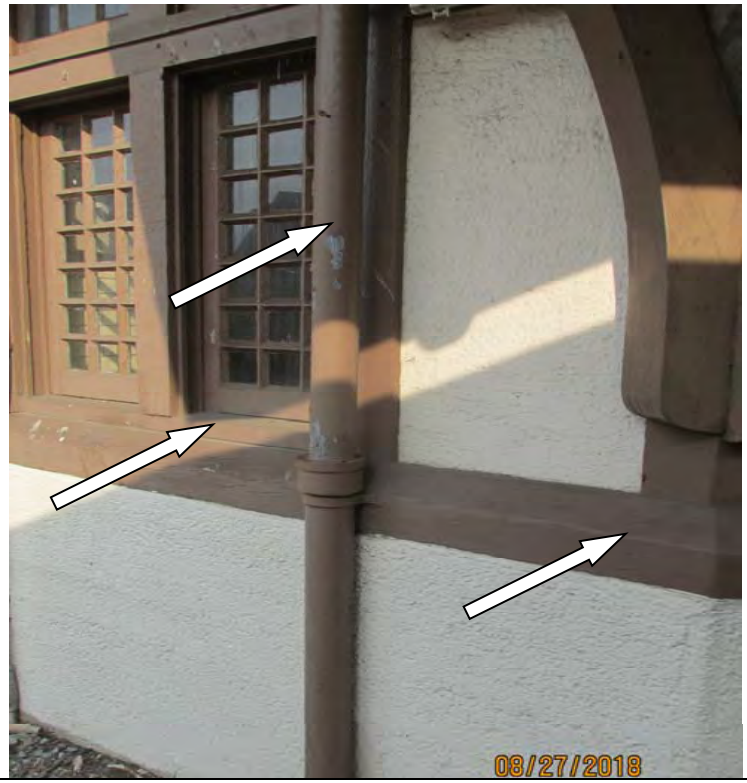


Photo No. 8

Location: Outbound -South Canopy
Description: Lead containing green paint on metal support beams (8/16/18 Reading No. 249 & 250).

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 9		**Photo No. 10**
Location: Outbound-Center Platform **Description:** Lead containing green paint on wood salt storage box (8/16/18 Reading No. 255).		**Location:** Building South elevation **Description:** Lead containing brown paint on wood horizontal wood trim (8/27/18 Reading No. 324). Lead containing brown paint on wood window frame (8/27/18 Reading No. 326). Lead containing brown paint on upper portion of metal downspout (8/27/18 Reading No. 327).	

Environmental Planning & Management, Inc.
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Lead Paint Survey Photographs

LOCATION: MNR SCARSDALE STATION

MNR Harlem Line – Scarsdale, NY

DATE: September, 2018

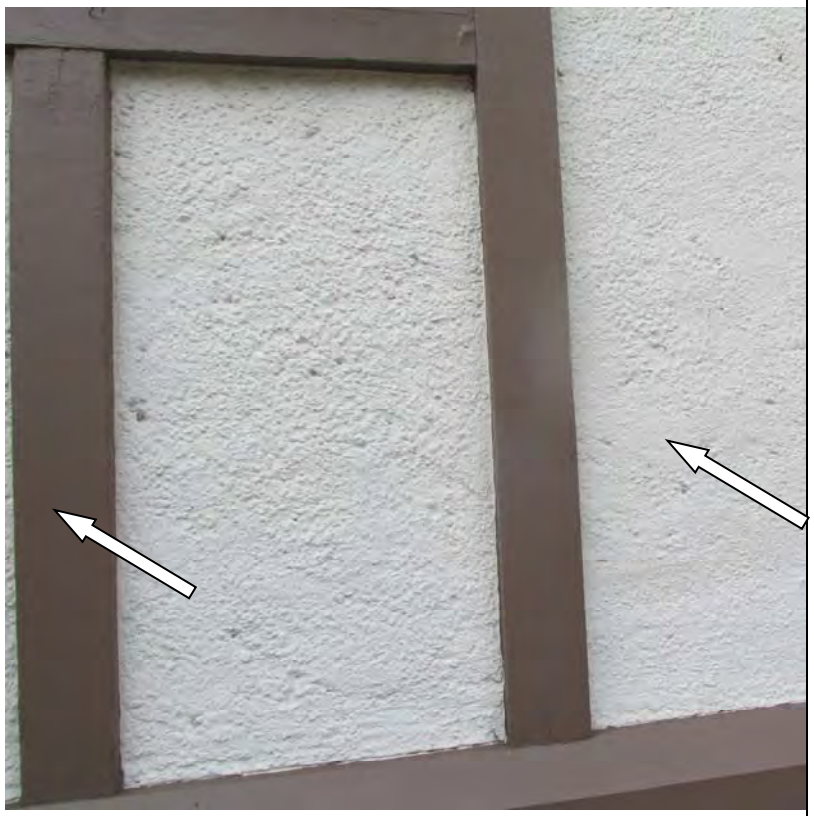
Photo No. 11

Location: Building east elevation, south door
Description: Lead containing brown paint on wood door (8/27/18 Reading No. 329). Lead containing brown paint on horizontal wood trim (8/27/18 Reading No. 331).

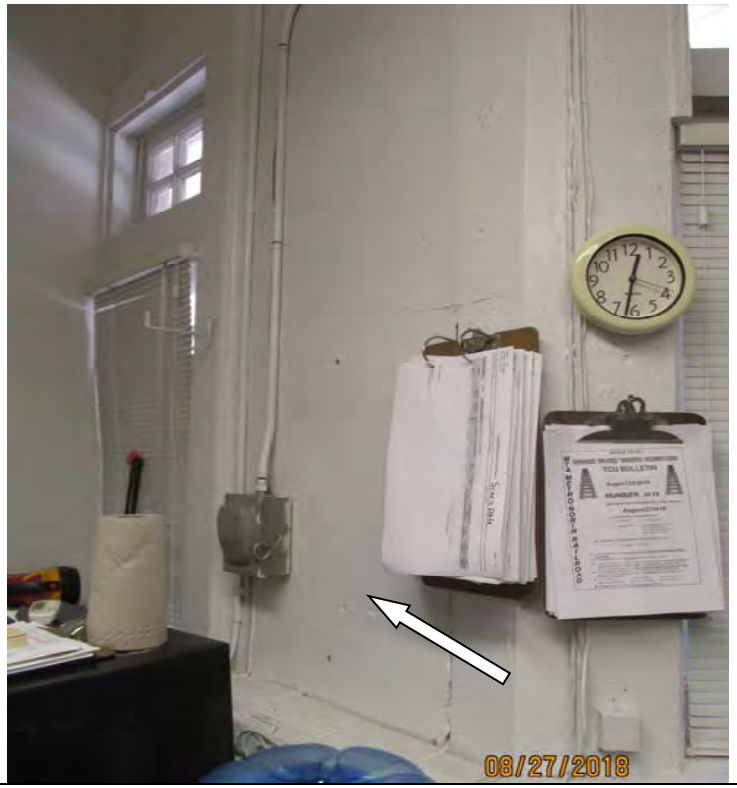
Photo No. 12

Location: Building east elevation
Description: Lead containing brown paint on wood window bump out (8/27/18 Reading No. 330).

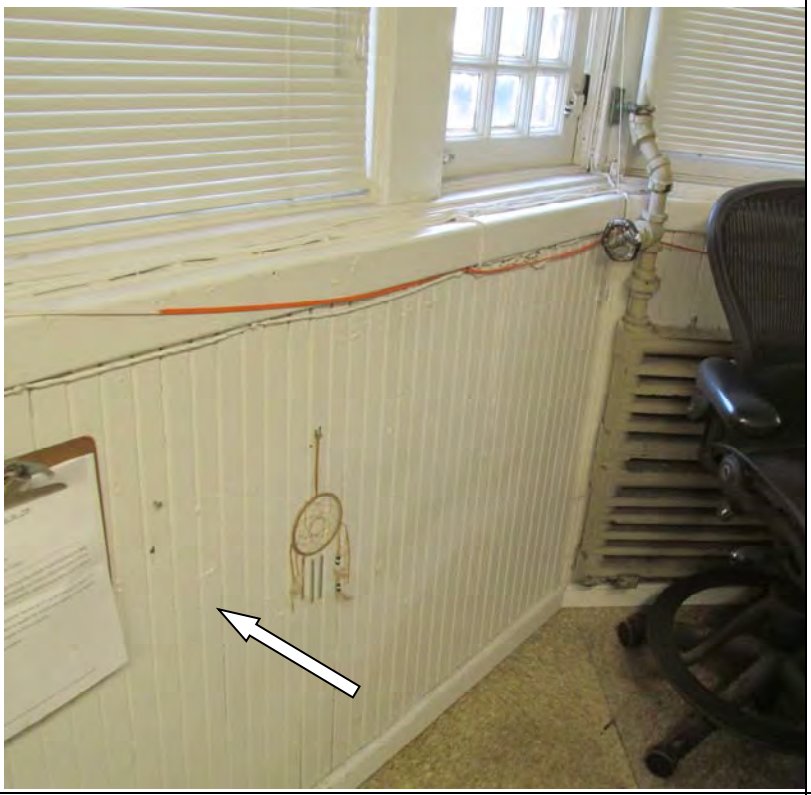
Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 13		**Photo No. 14**
Location: Building East elevation **Description: Description:** Lead containing brown paint on south wood buttress (8/27/18 Reading No. 333). Lead containing brown paint on wood horizontal trim (8/27/18 Reading No. 331). Lead containing tan paint on stucco/concrete facade (8/27/18 Reading No. 332).		**Location:** Building east elevation **Description:** Lead containing brown paint on wood fascia (8/27/18 Reading No. 334) – yellow arrow. Lead containing green painted roof tiles (8/27/18 Reading No. 335 & 336). Lead containing white paint on wood soffit - underside (8/27/18 Reading No. 337).	

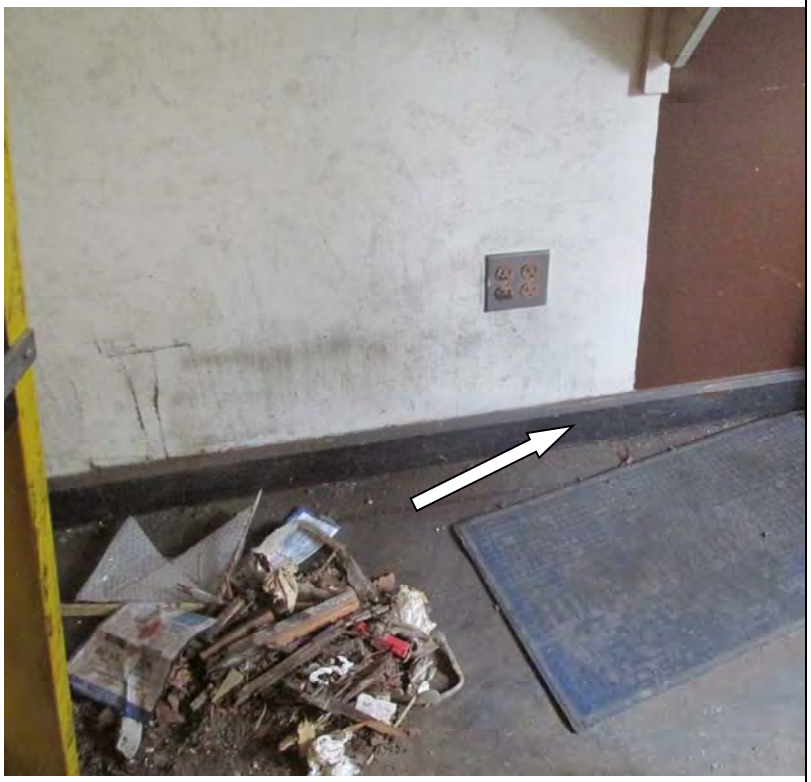
Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 15		**Photo No. 16**
Location: Building – North roof extension **Description: Description:** Lead containing brown paint on north column (8/27/18 Reading No. 340).		**Location:** Building north elevation **Description:** Lead containing brown paint on wood Vertical trim (8/27/18 Reading No. 341). Lead containing tan paint on stucco/concrete façade (8/27/18 Reading No. 342).	

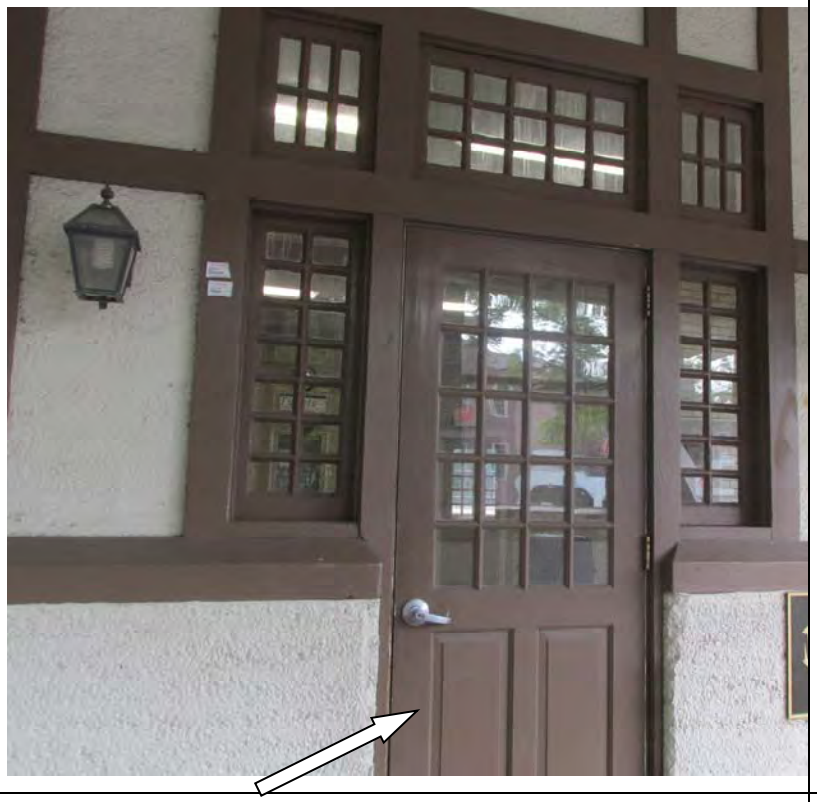
Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 17		**Photo No. 18**
Location: Building west elevation **Description: Description:** Lead containing green painted terra-cotta roof tiles (8/27/18 Reading No. 343). Lead containing brown paint on wood roof fascia (8/27/18 Reading No. 344). Lead containing brown paint on metal upper downspout (8/27/18 Reading No. 346) – green arrow.		**Location:** Building west elevation **Description:** Lead containing brown paint on metal Oil tank shed door (8/27/18 Reading No. 348). Lead containing brown paint on wood trim (8/27/18 Reading No. 349).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 19		**Photo No. 20**
Location: Interior of ticket office - East **Description: Description:** Lead containing brown paint on wood window frame (8/27/18 Reading No. 350).		**Location:** Interior of ticket office - E. So. Wall **Description:** Lead containing white paint on concrete wall (8/27/18 Reading No. 351 & 352).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 21		**Photo No. 22**
Location: Interior of ticket office **Description: Description:** Lead containing light brown paint on metal radiator (8/27/18 Reading No. 354).		**Location:** Interior of ticket office – west wall **Description:** Lead containing white paint on gypsum board wall (8/27/18 Reading No. 356).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 23		**Photo No. 24**
Location: Interior of ticket office – east wall **Description:** Lead containing white paint on lower slat wood boards (Reading No. 358)		**Location:** Boiler – west wall **Description:** Lead containing light blue paint on wood slat boards (8/27/18 Reading No. 359).	

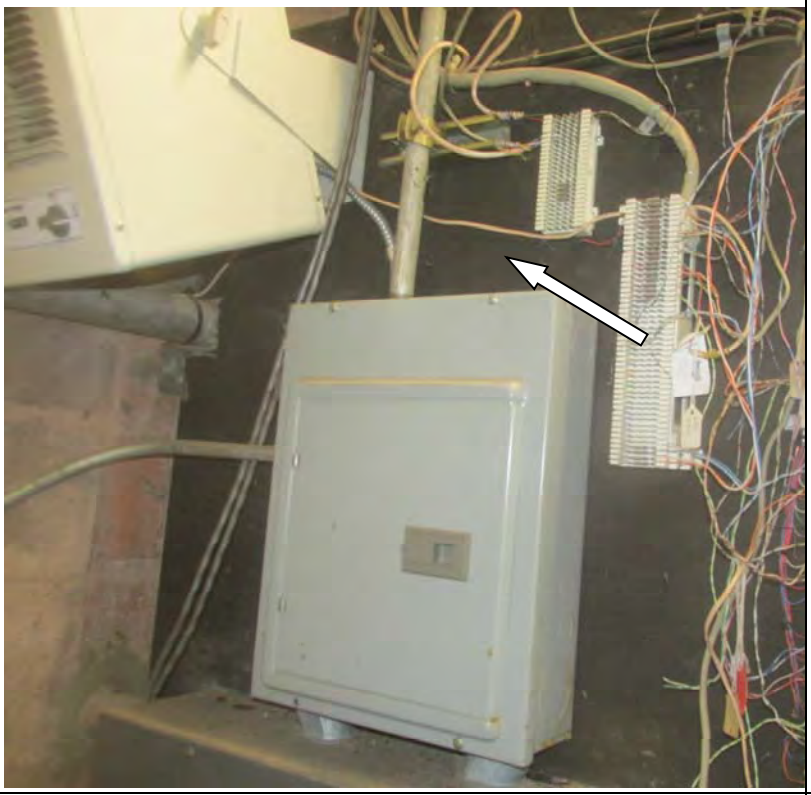
Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 25		**Photo No. 26**
Location: Interior Concession **Description:** Lead containing tan painted wood on ceiling (8/27/18 Reading No. 363).		**Location:** Interior Concession **Description:** Lead containing black paint on wood cove base (8/27/18 Reading No. 367).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 27		**Photo No. 28**
Location: Building - west elevation, Women's bathroom **Description:** Lead containing brown paint on wood window frame (8/27/18 Reading No. 368).		**Location:** South elevation, Entry door **Description:** Lead containing brown paint on wood door frame (8/27/18 Reading No. 369).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 29		**Photo No. 30**
Location: Stair **Description:** Lead containing green colored terra-cotta roof tiles (8/27/18 Reading No. 370).		**Location:** Platform **Description:** Lead containing yellow paint on plastic over concrete tactile warning strip (8/27/18 Reading No. 372).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 31		**Photo No. 32**
Location: Tank room **Description:** Lead containing black paint on metal oil tank (9/14/18 Reading No. 5, 6, 7 and 9).		**Location:** Tank room **Description:** Lead containing brown paint on metal door frame – interior side (9/14/18 Reading No. 11).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 33		**Photo No. 34**
Location: Elevator Machine room **Description:** Lead containing light blue paint on metal control cabinet (9/14/18 Reading Nos. 13 and 14). Lead containing light blue paint on metal Housing for oil (9/14/18 Reading No. 16) – green arrow.		**Location:** Elevator Machine room **Description:** Lead containing Gray paint on metal electrical cabinet (9/14/18 Reading No. 15). Lead containing dark gray paint on metal electrical pull box (9/14/18 Reading No. 17) – green arrow.	

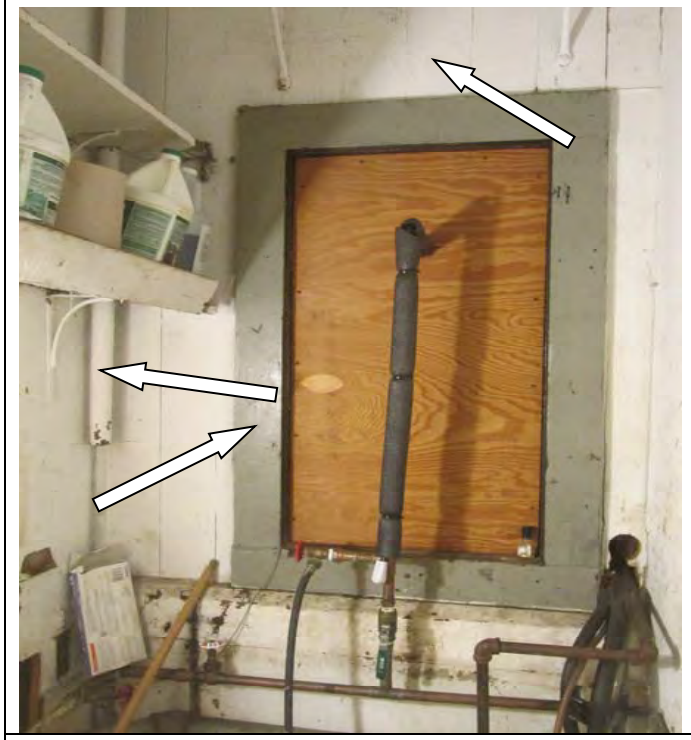
Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 35		**Photo No. 36**
Location: Elevator Machine room **Description:** Lead containing black paint on wood back board (9/14/18 Reading No. 18).		**Location:** Overpass **Description:** Lead containing white paint on wood ceiling (9/14/18 Reading No. 24).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 37		**Photo No. 38**
Location: Cellar **Description:** Lead containing white paint on concrete interior partition wall (9/14/18 Reading No. 31). Lead containing white paint on metal ceiling (9/14/18 Reading Nos. 33 & 34). Lead containing gray paint on concrete floor (9/14/18 Reading No. 35).		**Location:** Overpass **Description:** Lead containing black paint on metal pipe (9/14/18 Reading Nos. 36 & 37).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 39		**Photo No. 40**
Location: Cellar **Description:** Lead containing white paint on metal junction box (9/14/18 Reading No. 40).		**Location:** Attic **Description:** Lead containing black paint on metal pipe (9/14/18 Reading No. 42).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 41		**Photo No. 42**
Location: Corridor **Description:** Lead containing white paint on plaster ceiling (9/14/18 Reading Nos. 43-47 and 49-54). Lead containing white paint on wood hatch frame (9/14/18 Reading Nos. 55-58)		**Location:** Women's bathroom **Description:** Lead containing light brown painted ceramic wall tile (9/14/18 Reading No. 60 & 64). Lead containing tan paint on wood window frame (9/14/18 Reading No. 65). Lead containing white paint on wood window (9/14/18 Reading No. 66 & 67).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 43		**Photo No. 44**
Location: Women's bathroom **Description:** Lead containing tan paint on wood door frame (9/14/18 Reading Nos. 69). Lead containing tan paint on wood door – interior (9/14/18 Reading No. 68)		**Location:** Women's bathroom **Description:** Lead containing silver paint on metal radiator (9/14/18 Reading No. 71). Lead containing tan colored ceramic tile floor (9/14/18 Reading No. 72).	

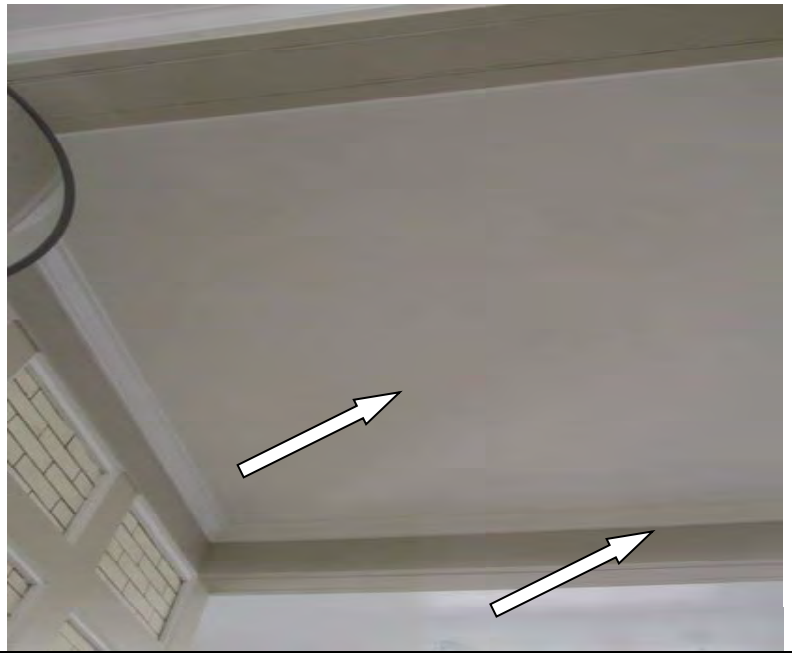
Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 45		**Photo No. 46**
Location: Janitor's Closet **Description:** Lead containing tan paint on wood window frame (9/14/18 Reading Nos. 73). Lead containing tan paint on wood wall paneling (9/14/18 Reading No. 74; homogeneous to readings 76 & 77). Lead containing white paint on metal pipe (9/14/18 Reading Nos. 78).		**Location:** Janitor's Closet **Description:** Lead containing white paint on concrete lower wall (9/14/18 Reading No. 75).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 47		**Photo No. 48**
Location: Janitor's Closet **Description:** Lead containing tan paint on wood door (9/14/18 Reading Nos. 79). Lead containing tan paint on wood door frame (9/14/18 Reading Nos. 80).		**Location:** Men's bathroom **Description:** Lead containing light brown colored ceramic wall tile (9/14/18 Reading No. 82 & 84). Lead containing tan paint on wood window frame (9/14/18 Reading No. 85 & 87). Lead containing white paint on wood window (9/14/18 Reading No. 86).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 49		**Photo No. 50**
Location: Men's bathroom **Description:** Lead containing silver paint on metal radiator (9/14/18 Reading Nos. 89 & 90) and lead containing silver paint on metal pipe (9/14/18 Reading Nos. 90). Lead containing tan painted ceramic floor tiles (9/14/18 Reading Nos. 91).		**Location:** Men's bathroom **Description:** Lead containing tan paint on wood door (9/14/18 Reading No. 92).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 49		**Photo No. 50**
Location: Corridor **Description:** Lead containing silver paint on metal pipe (9/14/18 Reading No. 94).		**Location:** Corridor **Description:** Lead containing tan painted ceramic floor tiles (9/14/18 Reading No. 95).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 51		**Photo No. 52**
Location: Common Area **Description:** Lead containing white paint on wood door frame (9/14/18 Reading No. 98). Lead containing white paint on wood window frame (9/14/18 Reading No. 99). Lead containing white paint on wood window (9/14/18 Reading No. 100). Lead containing tan paint on wood wall trim (9/14/18 Reading No. 101).		**Location:** Common Area **Description:** Lead containing white colored glazed brick on wall (9/14/18 Reading No. 102, 106 & 107). Lead containing tan paint on wood wall trim (9/14/18 Reading No. 103). Lead containing white paint on wood wall trim (9/14/18 Reading No. 104 & 105).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 51		**Photo No. 52**
Location: Common Area **Description:** Lead containing silver paint on metal radiator (9/14/18 Reading No. 108). Lead containing black paint on metal fireplace screen (9/14/18 Reading No. 109). Lead containing white paint on wood window (9/14/18 Reading No. 117). Lead containing tan paint on wood window frame (9/14/18 Reading No. 118).		**Location:** Common Area **Description:** Lead containing tan paint on wood beam (9/14/18 Reading No. 114). Lead containing white painted cement ceiling board (9/14/18 Reading No. 112 & 113).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 53		**Photo No. 54**
Location: Common Area **Description:** Lead containing black paint on metal bench arm rest (9/14/18 Reading No. 110).		**Location:** Common Area **Description:** Lead containing tan paint on wood door (9/14/18 Reading No. 115). Lead containing tan paint on wood trim om wall (9/14/18 Reading No. 119).	

Environmental Planning & Management, Inc. www.epmco.com **Lead Paint Survey Photographs**		**LOCATION:** MNR SCARSDALE STATION MNR Harlem Line – Scarsdale, NY **DATE:** September, 2018	
			
	Photo No. 55		**Photo No. 56**
Location: Common Area **Description:** Lead containing white paint on window (9/14/18 Reading No. 117). Lead containing white paint on window frame (9/14/18 Reading No. 118).		**Location:** Common Area **Description:** Lead containing green paint on wood phone booth (9/14/18 Reading No. 111).	

APPENDIX B
Company and Personnel Licenses

New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Environmental Planning & Management, Inc.
Suite 109
1983 Marcus Avenue

Lake Success, NY 11042

FILE NUMBER: 99-1017
LICENSE NUMBER: 28623
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 10/25/2018
EXPIRATION DATE: 11/30/2019

Duly Authorized Representative – Aphrodite Socrates:

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Eileen M. Franko, Director
For the Commissioner of Labor

SH 432 (8/12)

New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

Environmental Planning & Management, Inc.
Suite 109
1983 Marcus Avenue

Lake Success, NY 11042

FILE NUMBER: 99-1017
LICENSE NUMBER: 28623
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DATE OF ISSUE: 11/02/2017
EXPIRATION DATE: 11/30/2018

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This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Eileen M. Franko, Director
For the Commissioner of Labor

SH 432 (8/12)

United States Environmental Protection Agency

This is to certify that

Environmental Planning & Management, Inc.

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires May 14, 2021

LBP-2003-1

Certification #

October 25, 2017

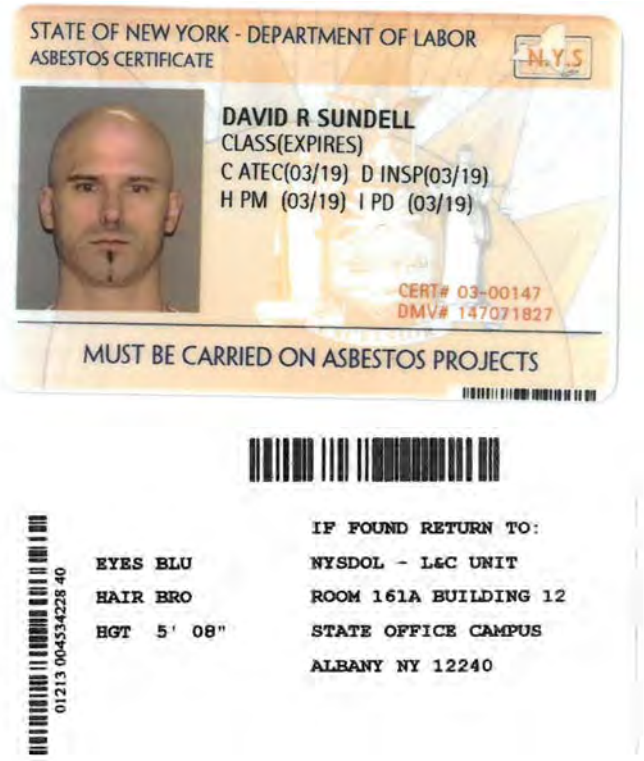
Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

Environmental Planning & Management, Inc.
www.epmco.com

DAVID SUNDELL



A – Asbestos Handling

B – Restricted Handler – Allied Trades

C – Air Sampling Technician

D – Inspector

E- Management Planner

F – Operations and Maintenance

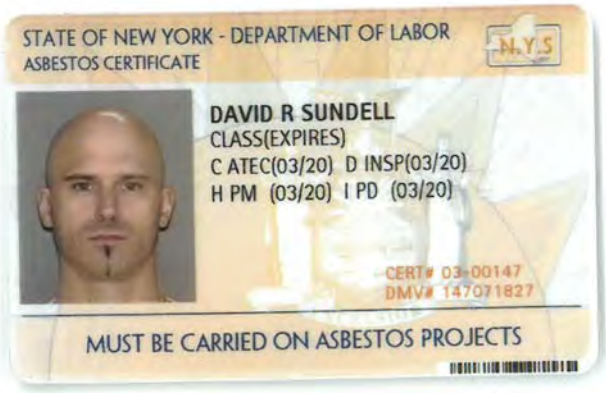
G – Supervisor

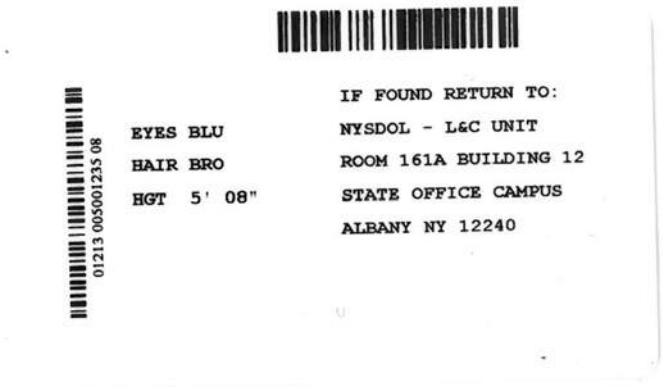
H – Project Monitor

I – Project Designer

Environmental Planning & Management, Inc.
www.epmco.com

DAVID R SUNDELL





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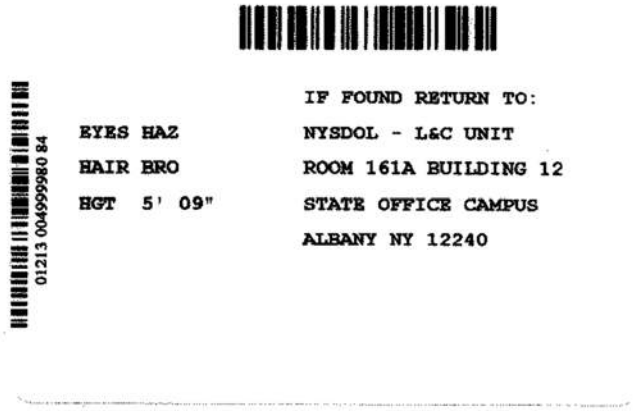
DARREN FRANK



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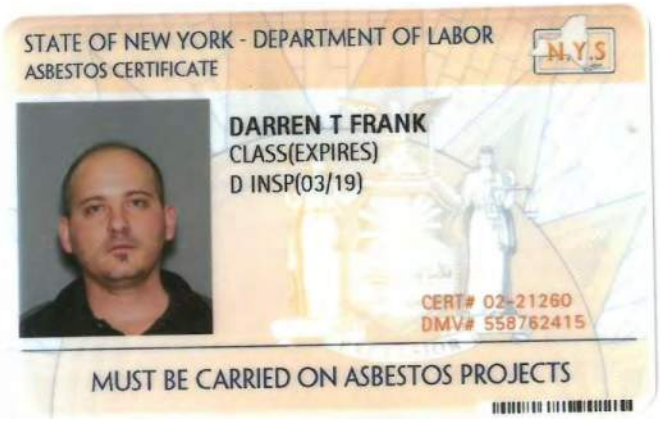

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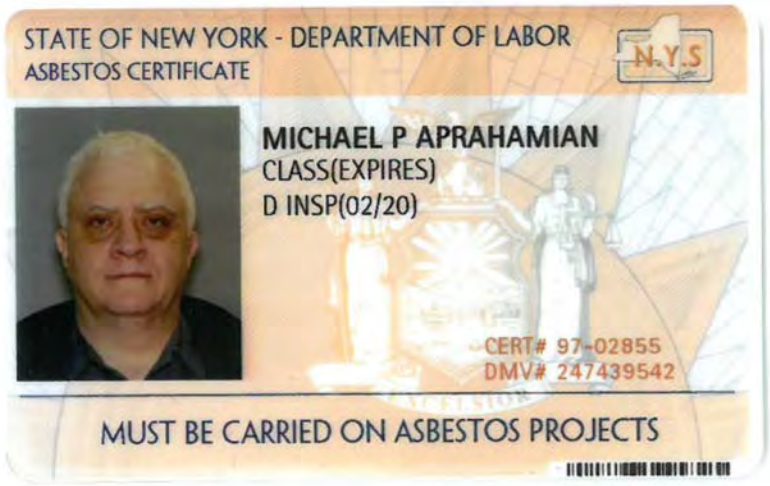
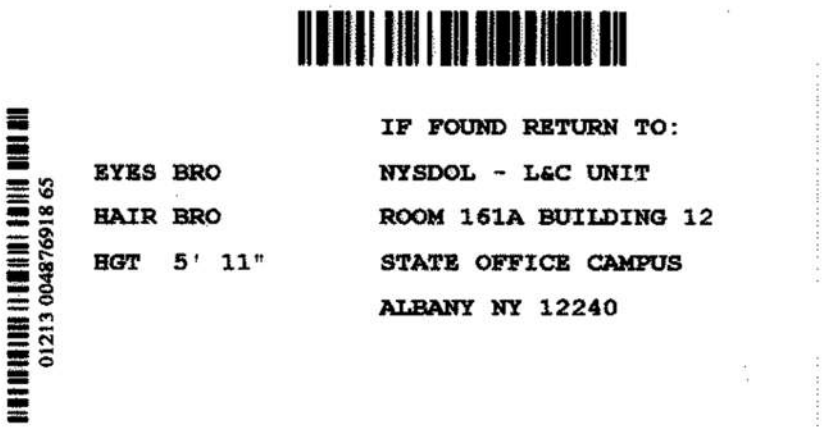
www.epmco.com

MICHAEL APRAHAMIAN





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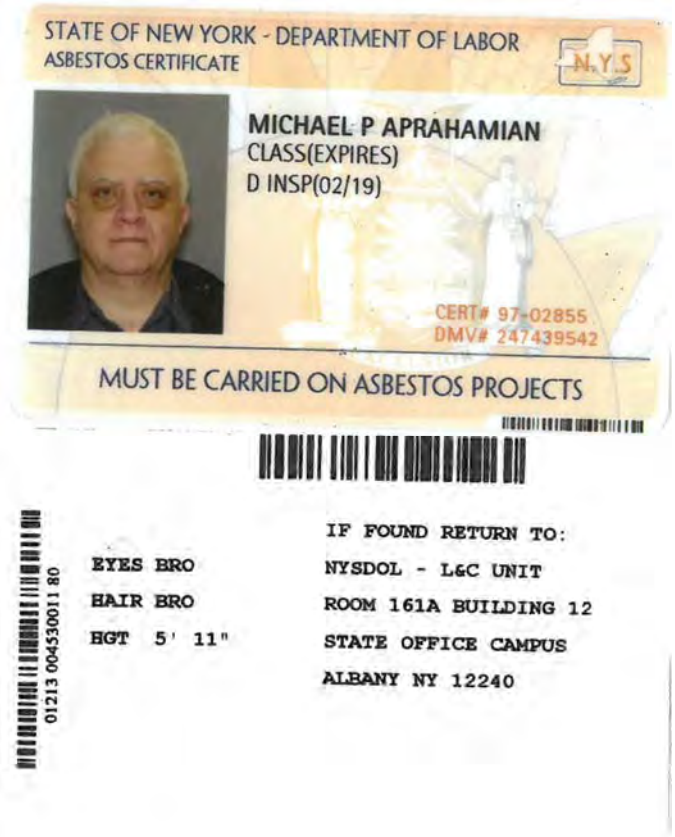
MICHAEL APRAHAMIAN



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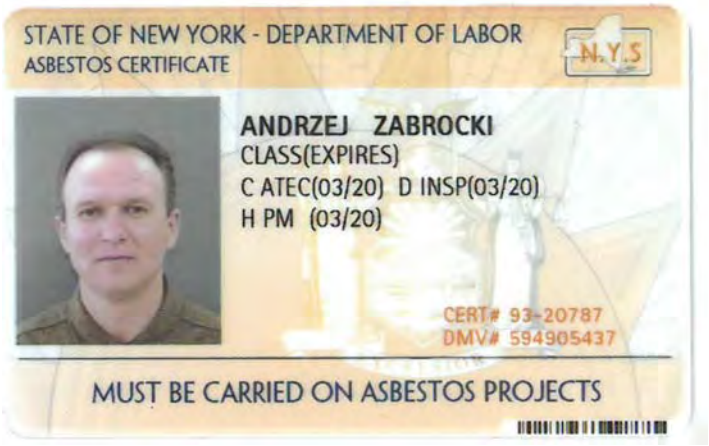
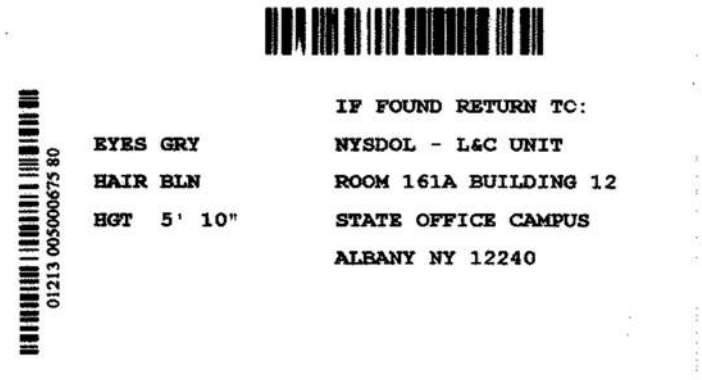
www.epmco.com

ANDRZEJ ZABROCKI


STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE
N.Y.S
ANDRZEJ ZABROCKI
CLASS(EXPIRES)
C ATEC(03/20) D INSP(03/20)
H PM (03/20)
CERT# 93-20787
DMV# 594905437
MUST BE CARRIED ON ASBESTOS PROJECTS


01213 005000675 80
EYES GRY
HAIR BLN
HGT 5' 10"
IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

A – Asbestos Handling

B – Restricted Handler – Allied Trades

C – Air Sampling Technician

D – Inspector

E- Management Planner

F – Operations and Maintenance

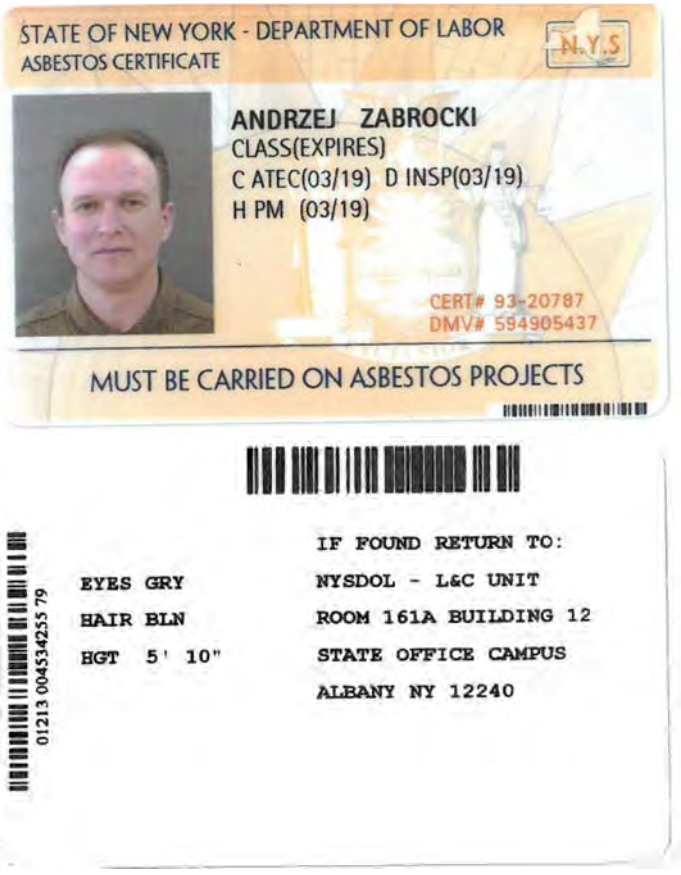
G – Supervisor

H – Project Monitor

I – Project Designer

Environmental Planning & Management, Inc.
www.epmco.com

ANDY ZABROCKI



A – Asbestos Handling

B – Restricted Handler – Allied Trades

C – Air Sampling Technician

D – Inspector

E- Management Planner

F – Operations and Maintenance

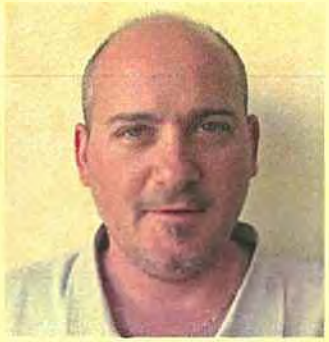
G – Supervisor

H – Project Monitor

I – Project Designer

United States Environmental Protection Agency

This is to certify that



Darren T. Frank

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Inspector

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires November 16, 2019

LBP-I-9510-1
Certification #

October 17, 2016
Issued On

John Gorman, Chief
Pesticides & Toxic Substances Branch

United States Environmental Protection Agency

This is to certify that

David R Sundell

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Inspector

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires June 03, 2021

LBP-I-I153646-1
Certification #

May 03, 2018
Issued On

John Gorman, Chief
Pesticides & Toxic Substances Branch

United States Environmental Protection Agency

This is to certify that

Andrzej Zabrocki

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Inspector

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires June 03, 2021

LBP-I-11979-1

Certification #

May 03, 2018

Issued On

John Gorman, Chief

Pesticides & Toxic Substances Branch

United States Environmental Protection Agency

This is to certify that

Michael P Aprahamian

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Inspector

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires March 08, 2022

LBP-I-I195783-1

Certification #

February 22, 2019

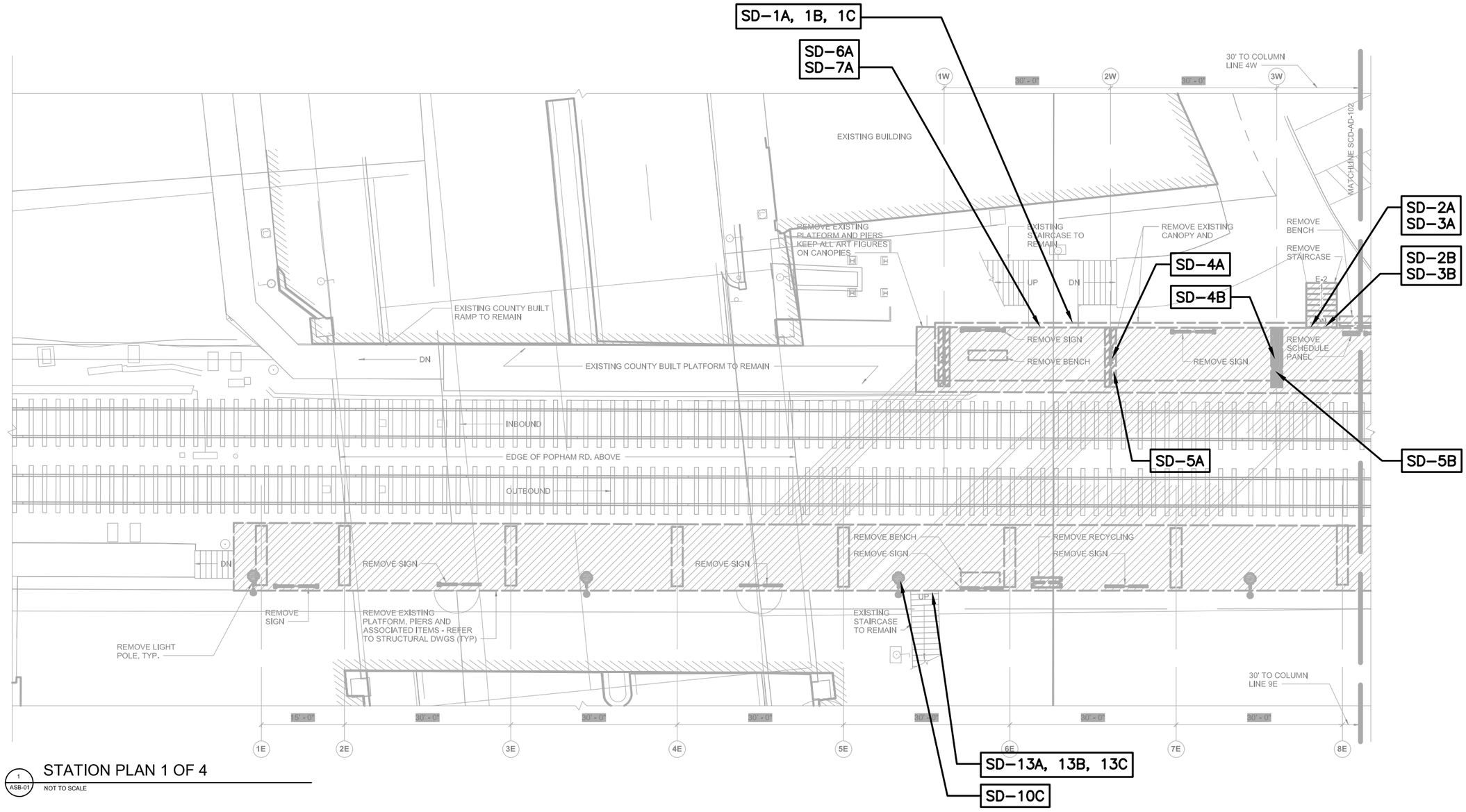
Issued On

John Gorman, Chief

Pesticides & Toxic Substances Branch

APPENDIX C
Asbestos Bulk Sample and Lead-Paint Shot Location Schematic

Asbestos Bulk Sample Location Schematic



1 ASB-01 STATION PLAN 1 OF 4

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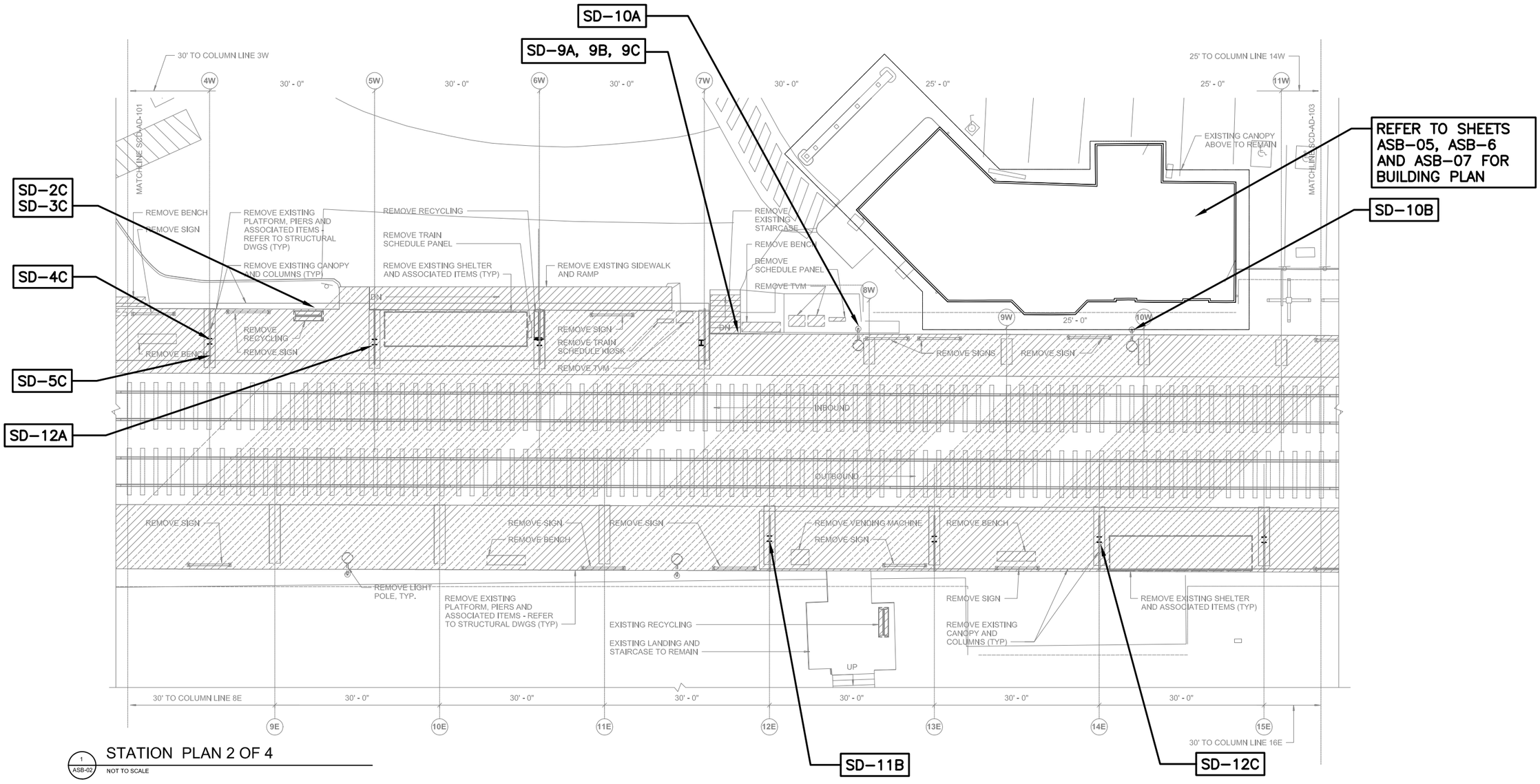
			FIGURE NO: **ASB-01** SHEET # 1 OF 7



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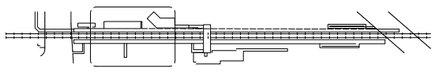

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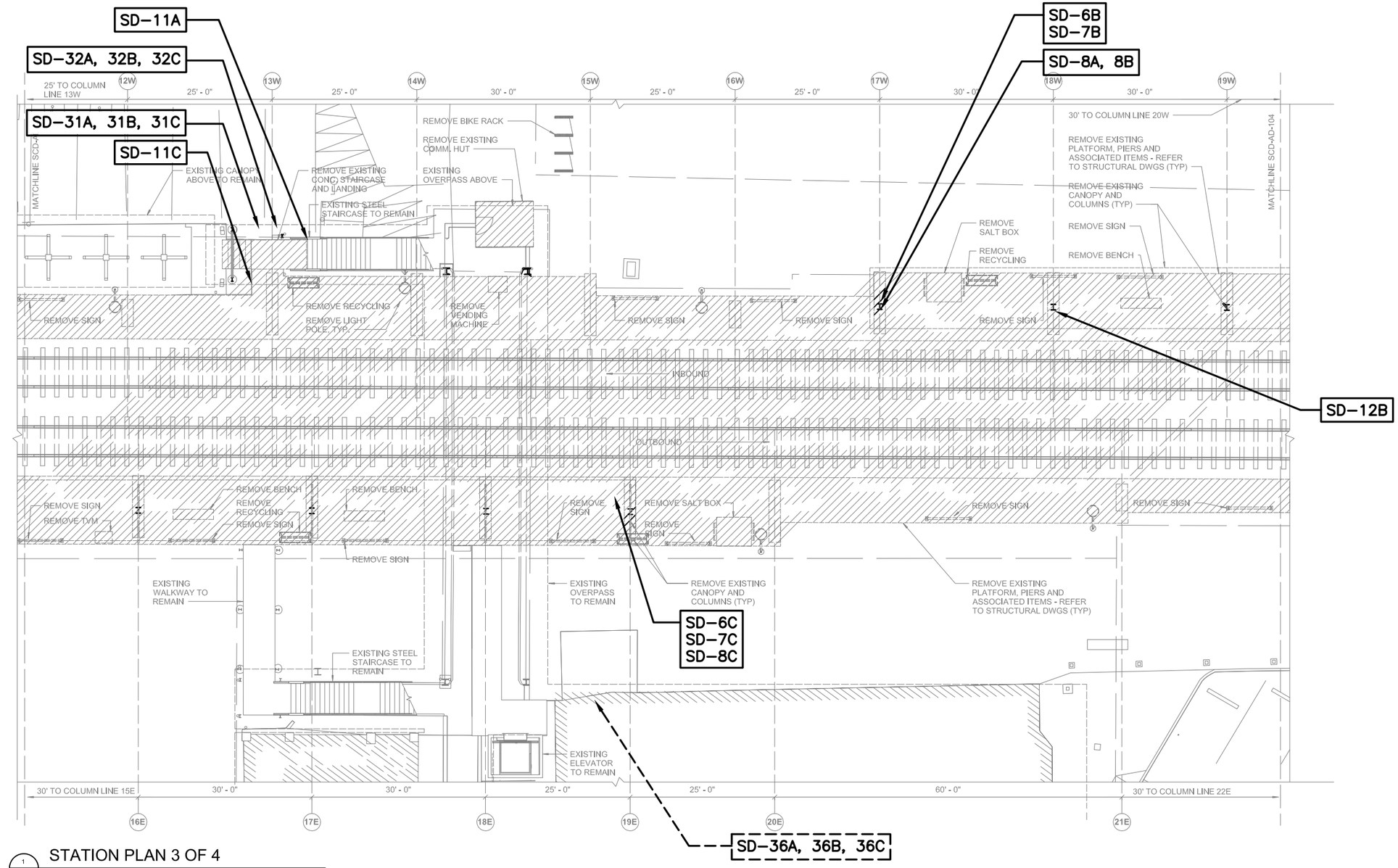
EPM Environmental Planning & Management, Inc. www.epmco.com



STATION PLAN 3 OF 4

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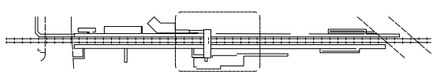

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TO BE REMOVED

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SD–XX SAMPLES COLLECTED IN INTERIOR OF STRUCTURE

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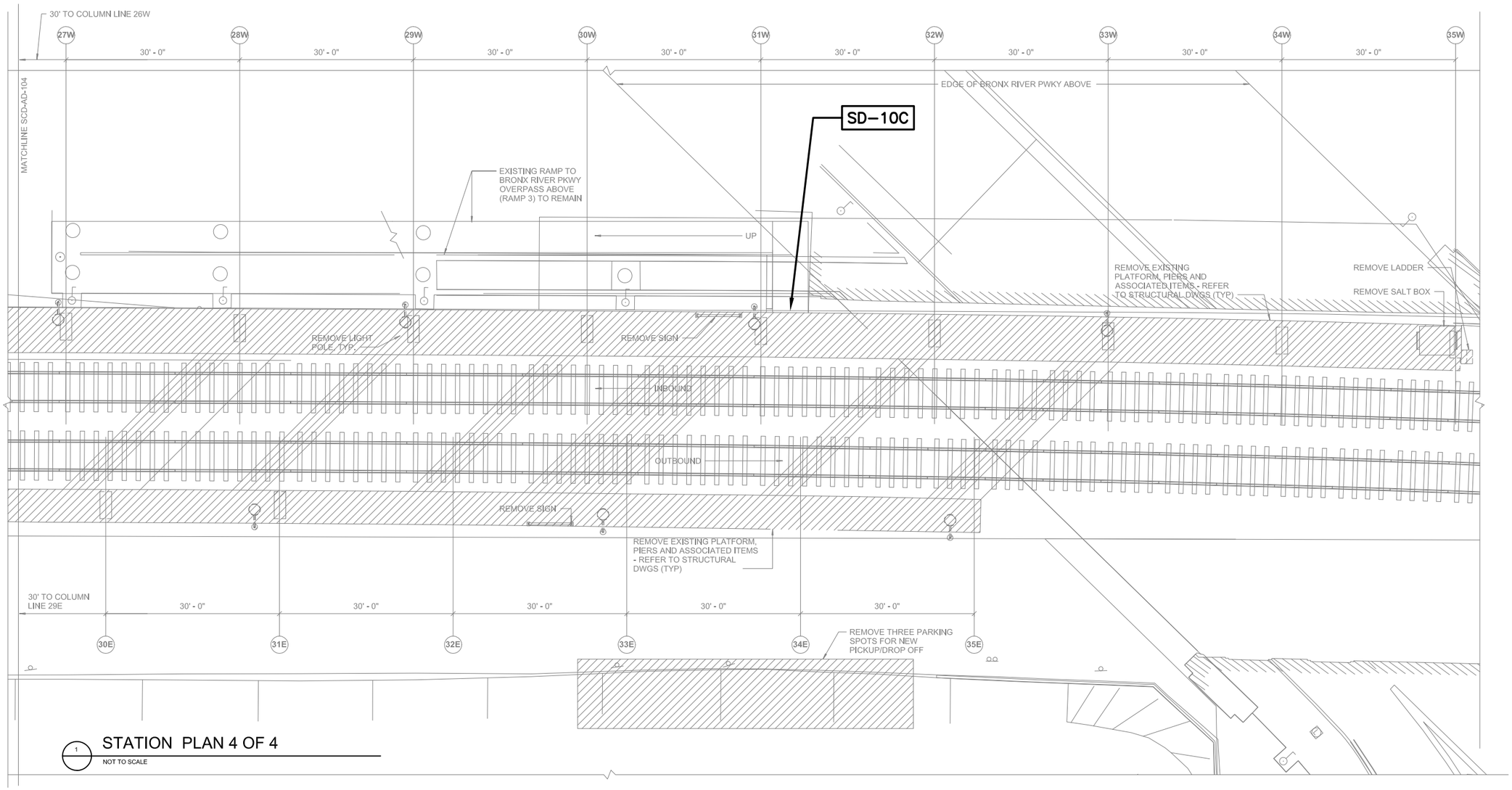

1 STATION PLAN 4 OF 4
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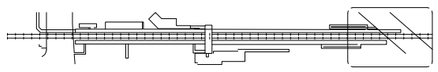

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EPM Environmental Planning & Management, Inc. www.epmco.com

CLIENT: MTA Metro-North Railroad, Office of System Safety, 420 Lexington Ave. Suite 930, New York, NY 10170

PROJECT NAME: DESIGN BUILD SERVICES FOR SCARSDALE AND HARTSDALE STATION IMPROVEMENTS

DRAWING NAME: STATION PLAN

PROJECT TITLE: SCARSDALE STATION, WESTCHESTER, NY
ASBESTOS BULK SAMPLE LOCATION SCHEMATIC

FIGURE NO: **ASB-04**

SHEET # 4 OF 7

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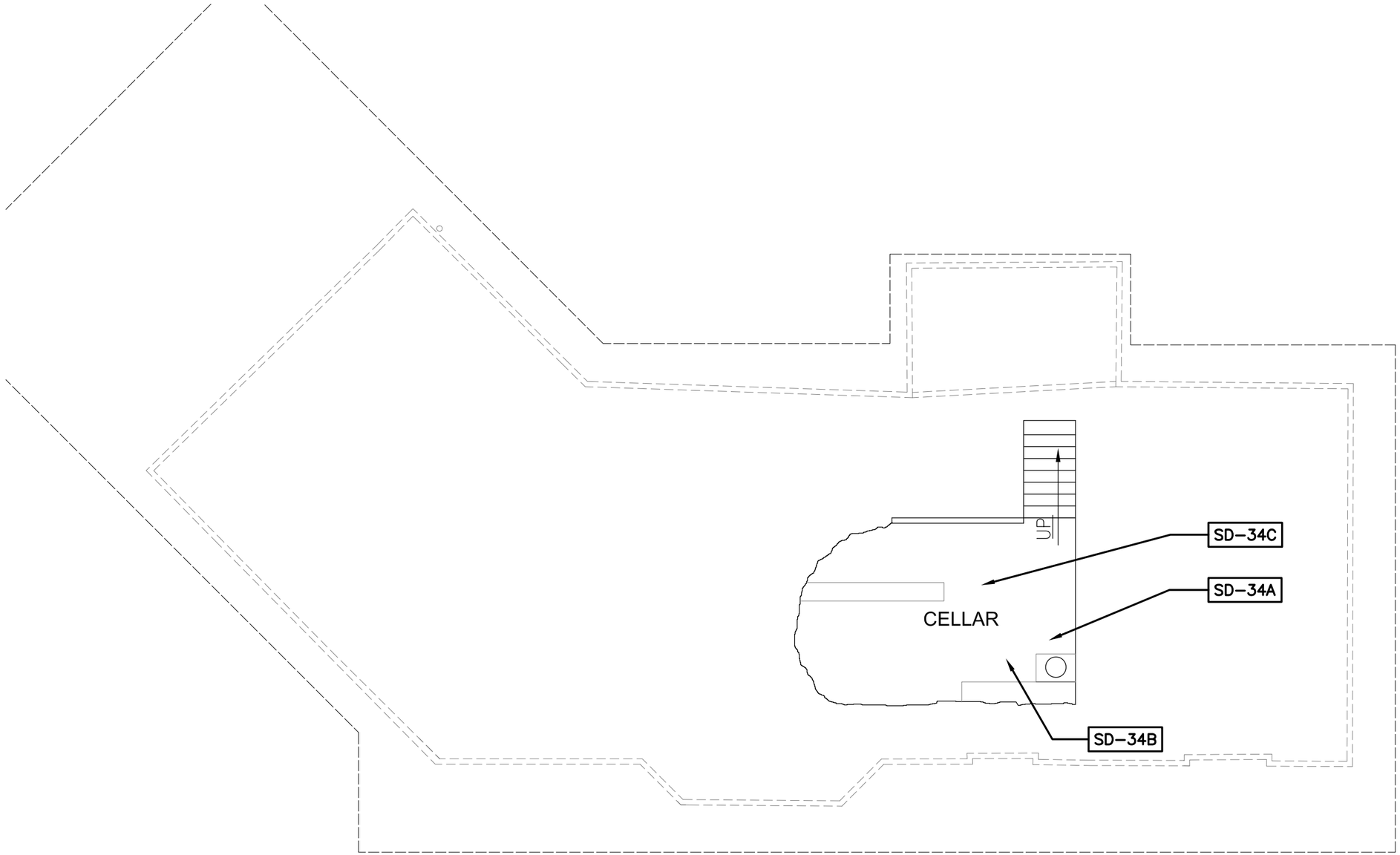

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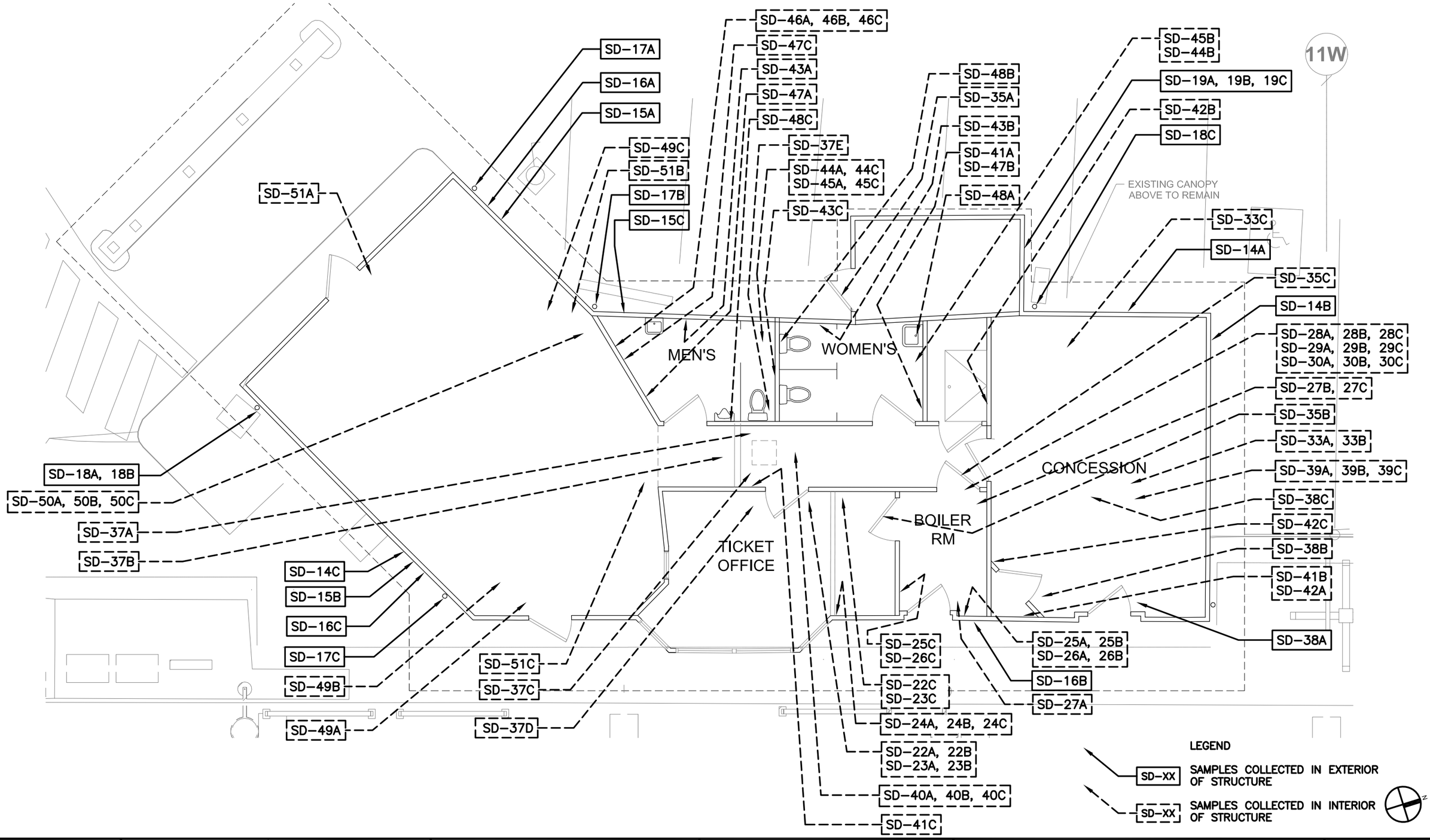

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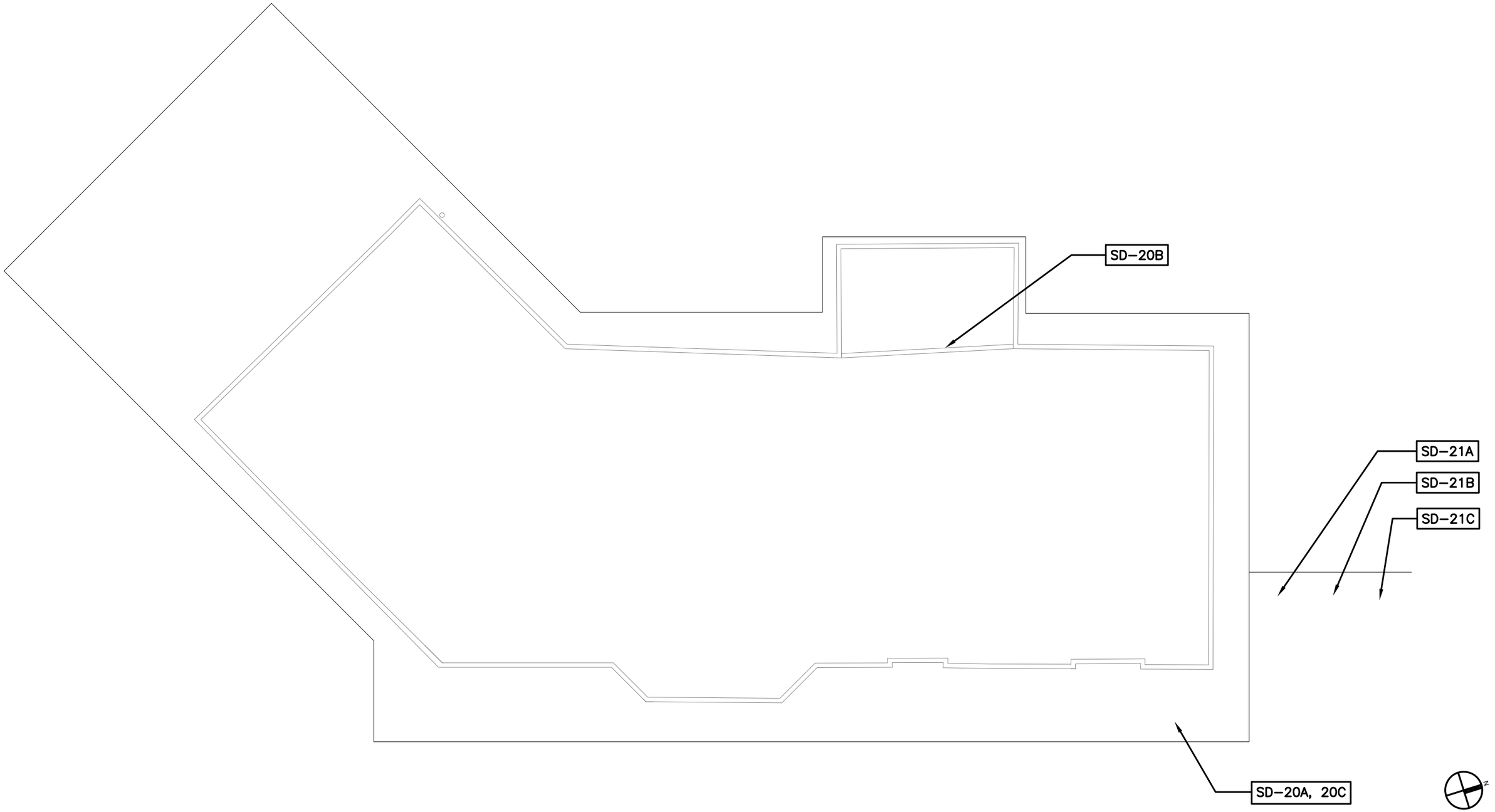

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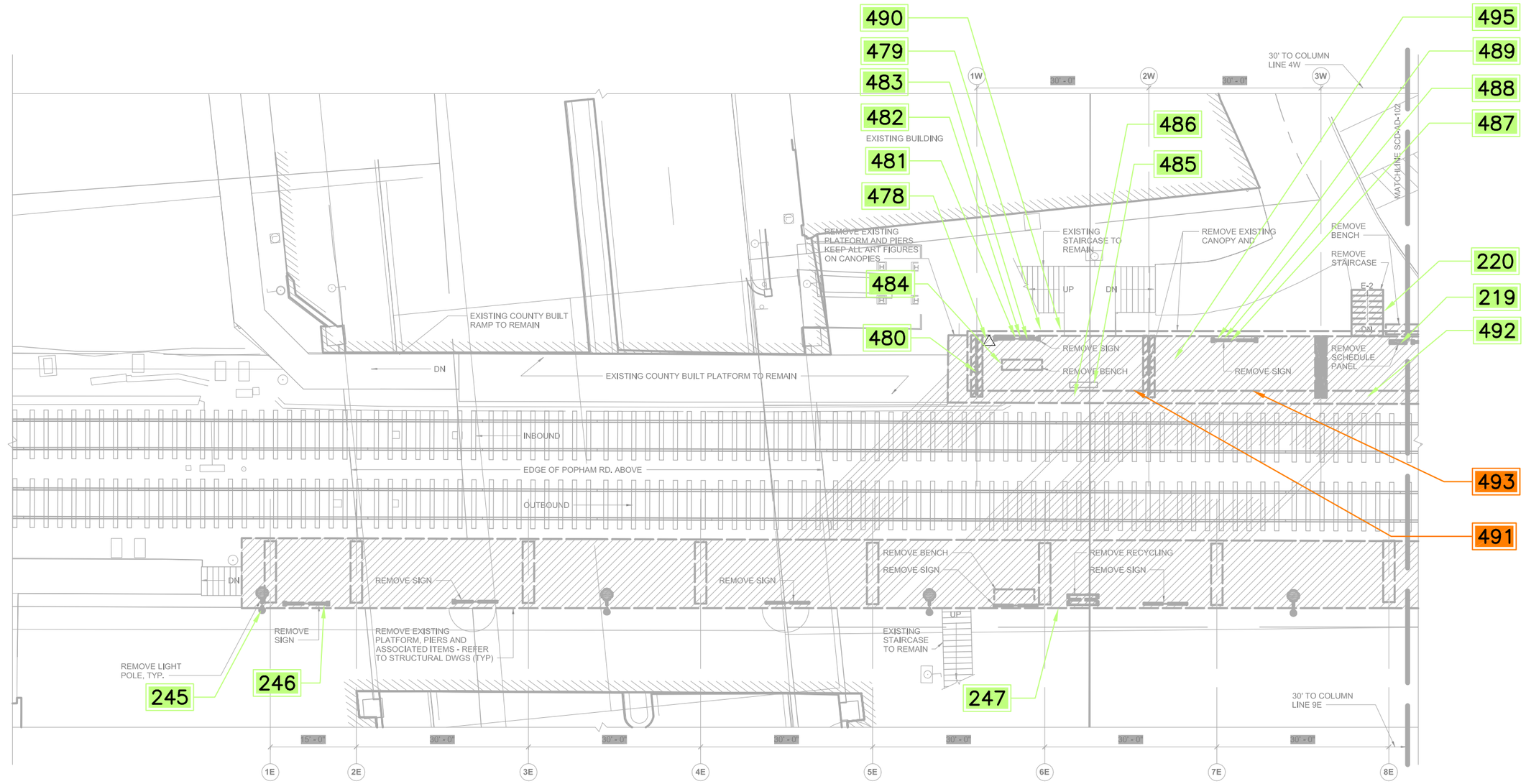
Lead-Paint Shot Location Schematic



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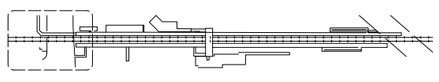

LEGEND:

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XRF READING NO. LEAD RESULT ≥ 0.01 mg/cm² (LEAD CONTAINING)

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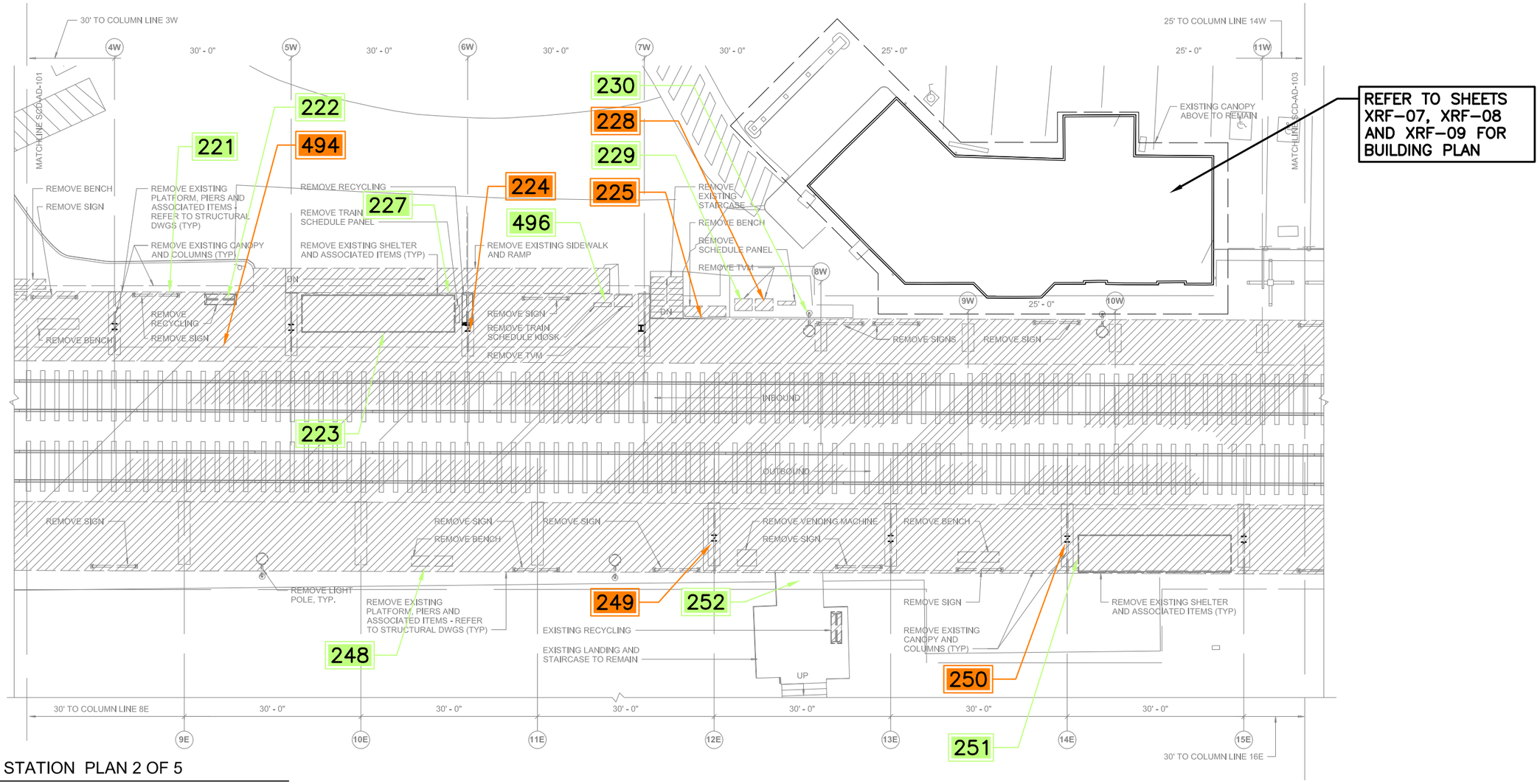

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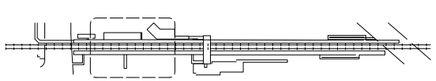

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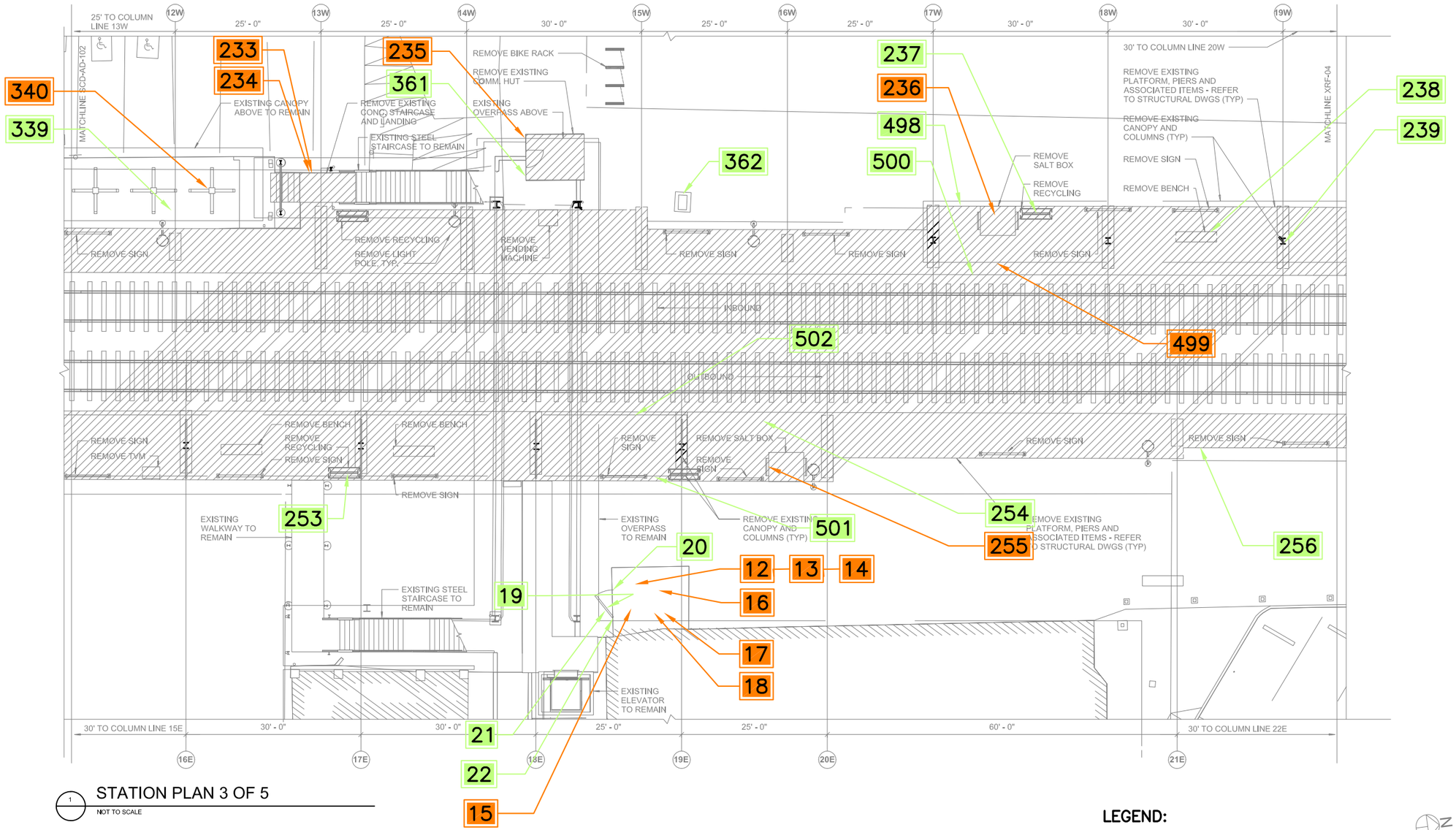

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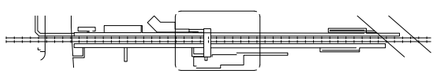

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Environmental Planning & Management, Inc. www.epmco.com	DRAWN BY: MH/AR	DATE: SEPT. 2018	CLIENT: MTA Metro-North Railroad, Office of System Safety, 420 Lexington Ave. Suite 930, New York, NY 10170
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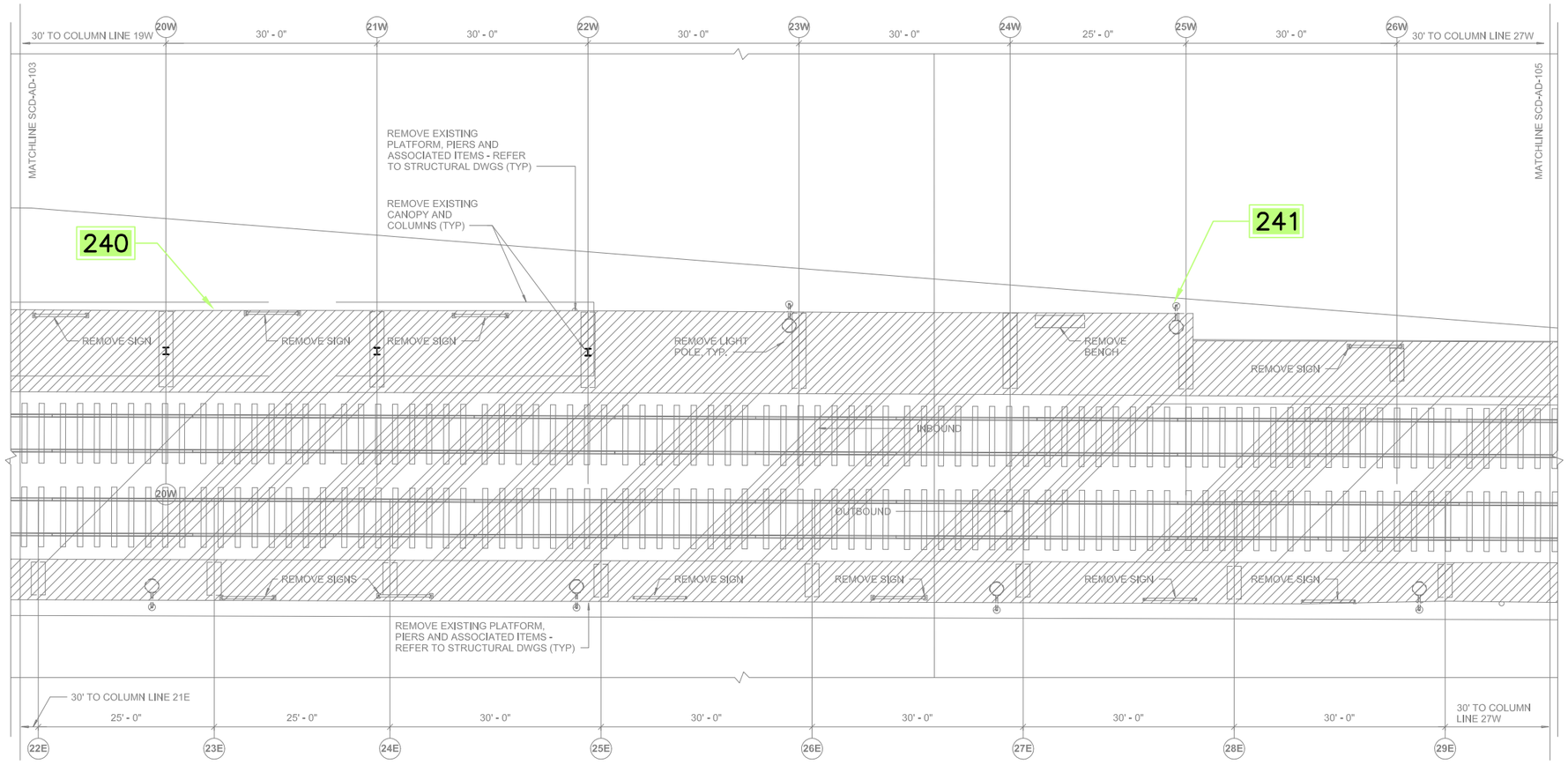

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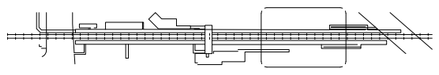

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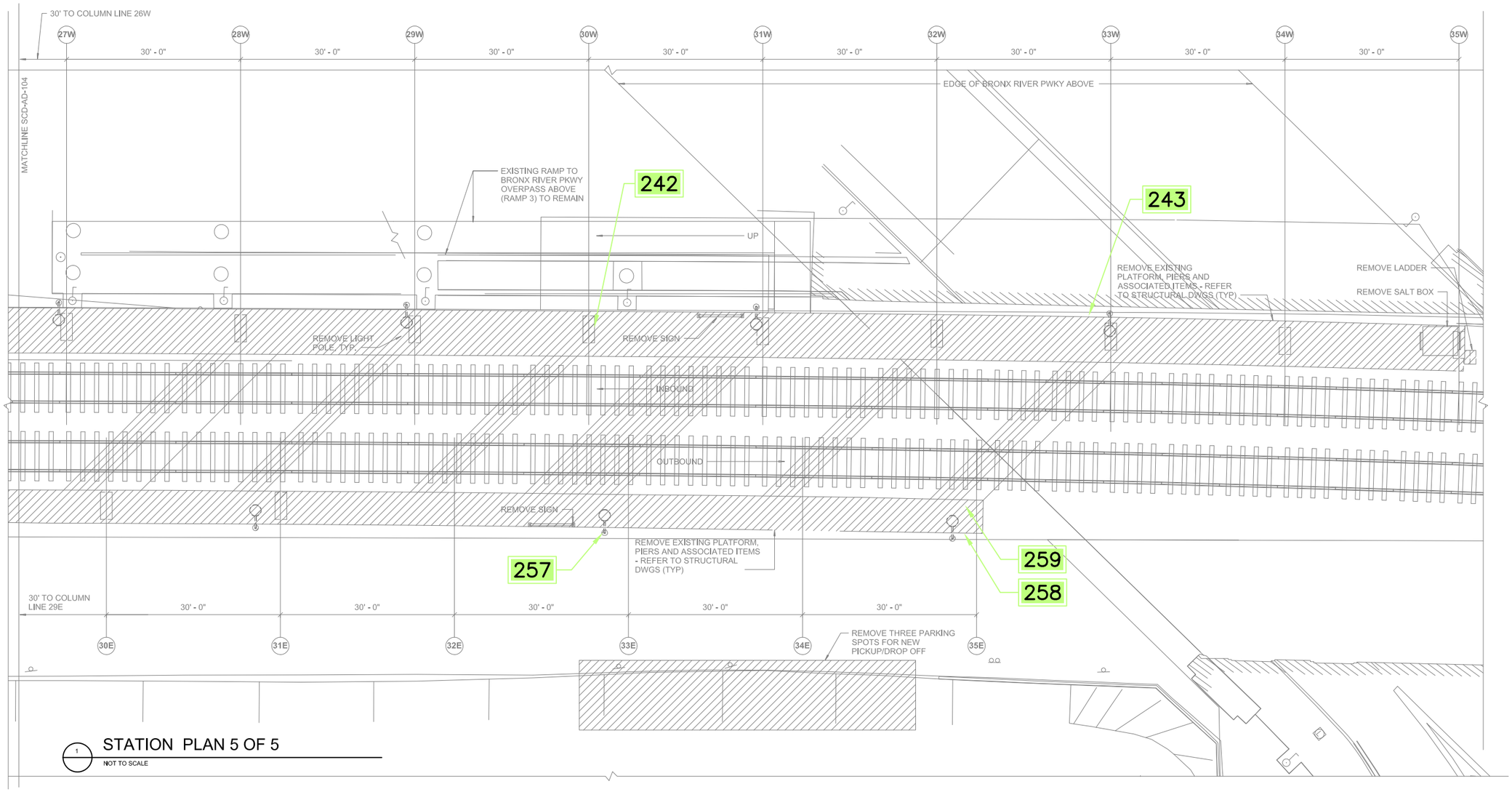

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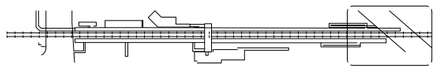

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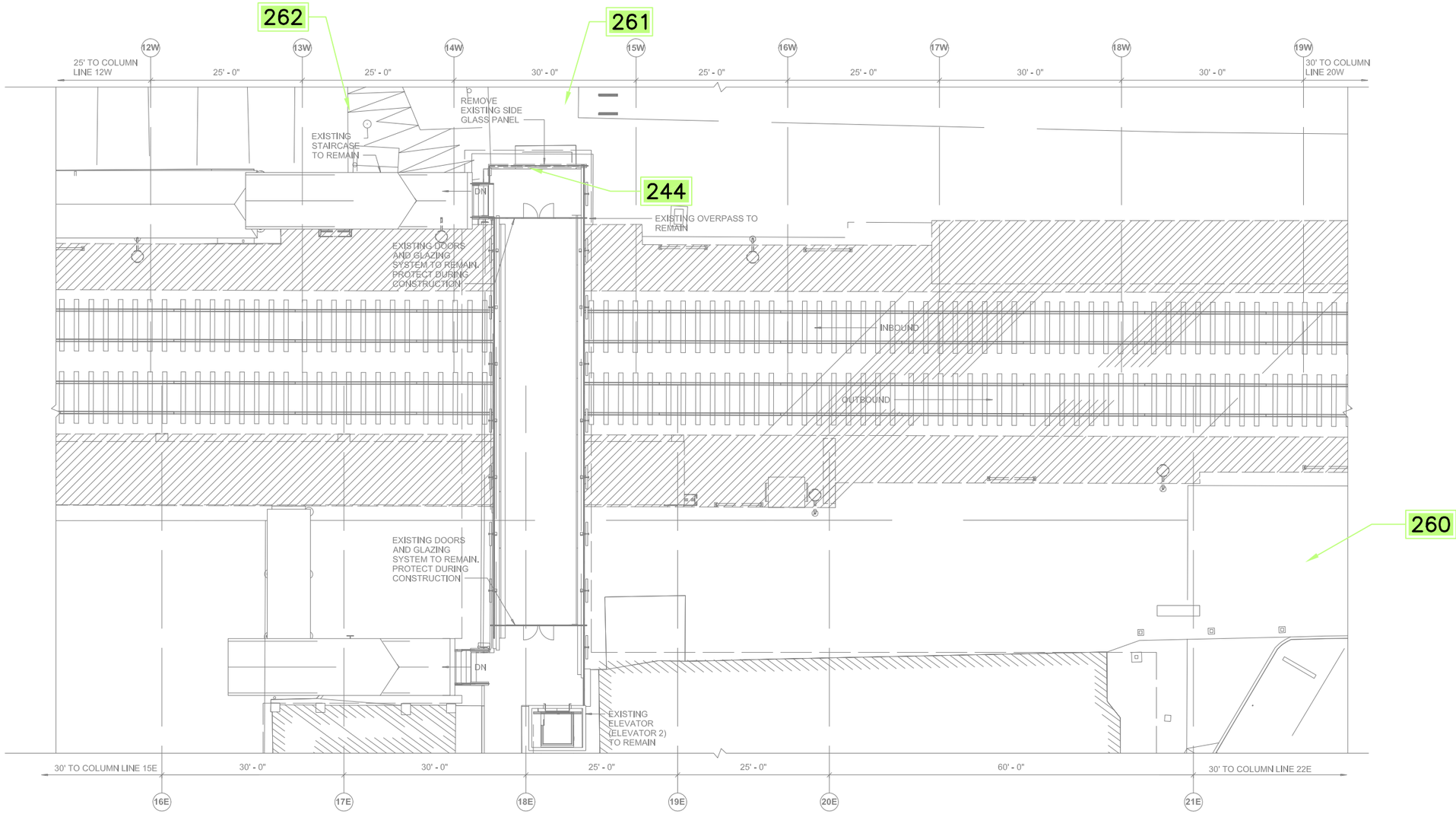
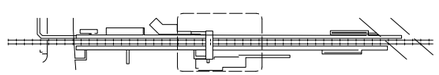


STATION DEMOLITION PLAN (OVERPASS LEVEL)

1/8" = 1'-0"

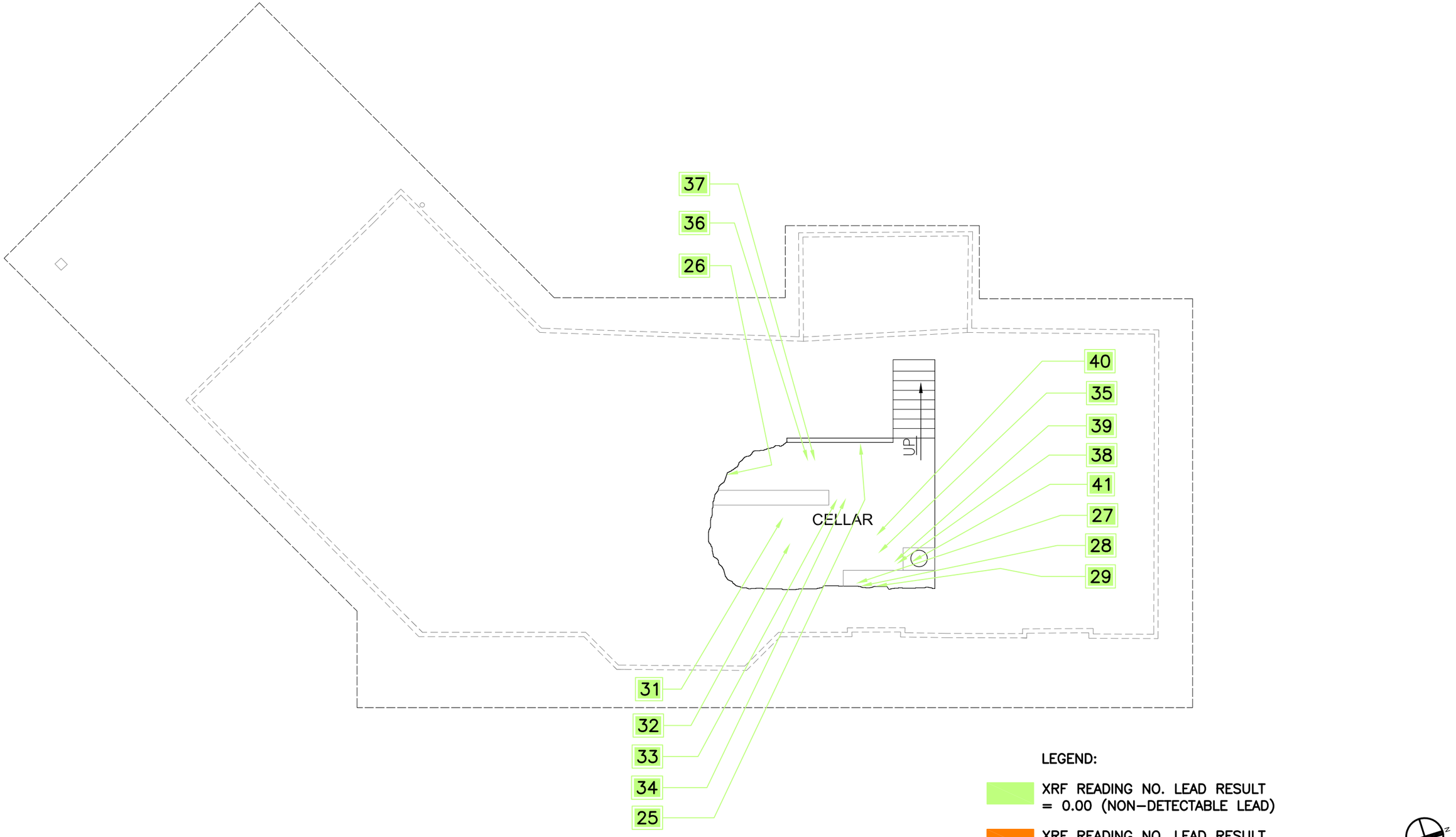


LEGEND:

XRF READING NO. LEAD RESULT = 0.00 (NON-DETECTABLE LEAD)

XRF READING NO. LEAD RESULT ≥ 0.01 mg/cm² (LEAD CONTAINING)

EPM Environmental Planning & Management, Inc. www.epmco.com	DRAWN BY: MH/AR; DATE: SEPT. 2018; CHECKED BY: MA; FILENAME: SCARSDALE STA; APPR'VD BY: SG; SCALE: NOT TO SCALE; PATH: X:\Metro North RR\18041-Term\Task 3 OSS# HAL -18-040-AL	CLIENT: MTA Metro-North Railroad, Office of System Safety, 420 Lexington Ave. Suite 930, New York, NY 10170	PROJECT NAME: DESIGN BUILD SERVICES FOR SCARSDALE AND HARTSDALE STATION IMPROVEMENTS	DRAWING NAME: OVERPASS LEVEL; PROJECT TITLE: SCARSDALE STATION, WESTCHESTER, NY XRF SHOTS LOCATION SCHEMATIC	FIGURE NO: XRF-06; SHEET # 6 OF 09



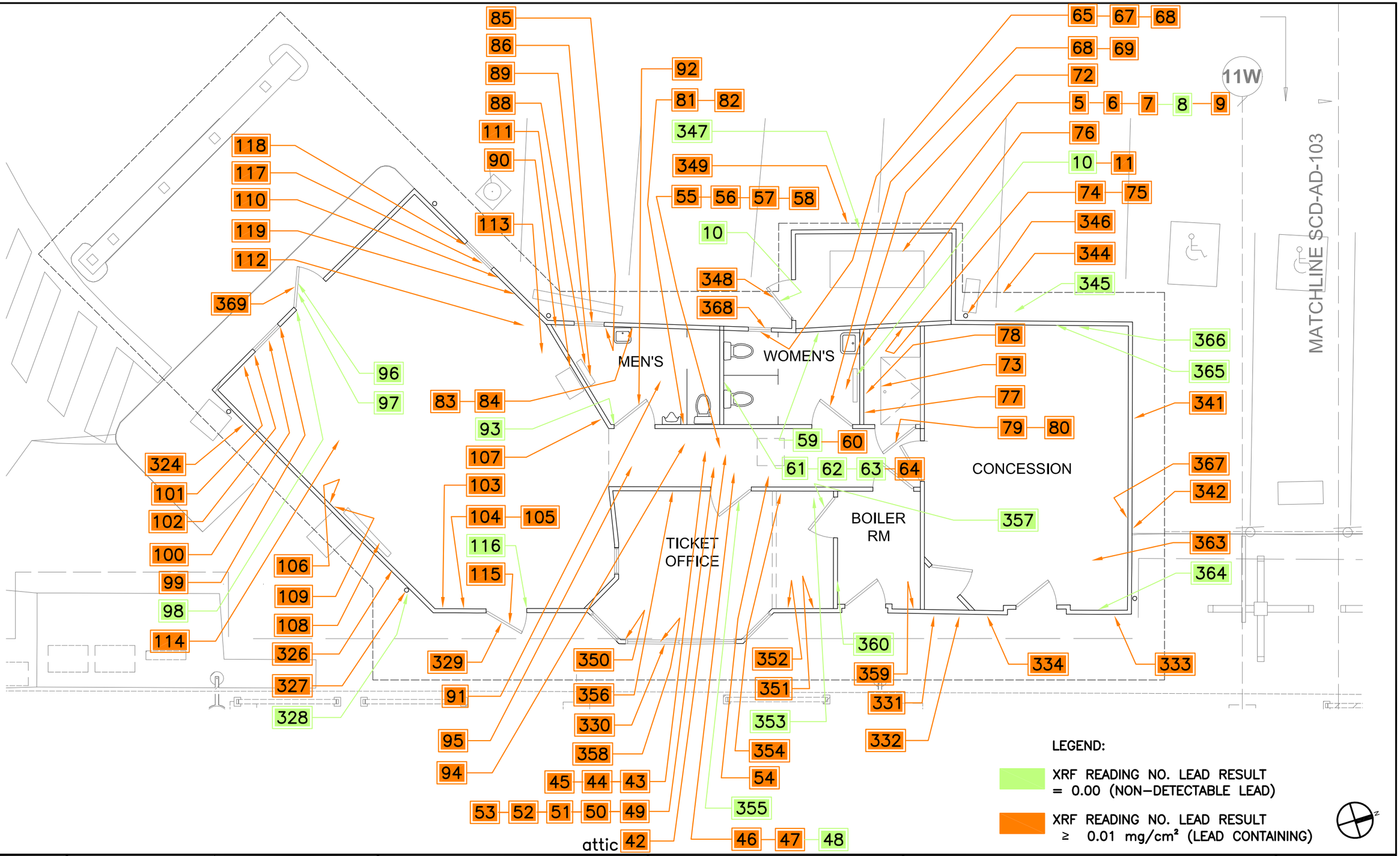
LEGEND:

XRF READING NO. LEAD RESULT = 0.00 (NON–DETECTABLE LEAD)

XRF READING NO. LEAD RESULT ≥ 0.01 mg/cm² (LEAD CONTAINING)

EPM Environmental Planning & Management, Inc. www.epmco.com	DRAWN BY: MH/AR; CHECKED BY: MA; APPR'VD BY: SG; PATH: X:\Metro North RR\18041–Term\Task 3 OSS# HAL –18–040–AL	DATE: SEPT. 2018; FILENAME: SCARSDALE STA; SCALE: NOT TO SCALE	CLIENT: MTA Metro-North Railroad, Office of System Safety, 420 Lexington Ave. Suite 930, New York, NY 10170
PROJECT NAME: DESIGN BUILD SERVICES FOR SCARSDALE AND HARTSDALE STATION IMPROVEMENTS	DRAWING NAME: CELLAR PLAN - BLDG ADJACENT TO STATION; PROJECT TITLE: SCARSDALE STATION, WESTCHESTER, NY XRF SHOTS LOCATION SCHEMATIC	FIGURE NO: **XRF-07** SHEET # 7 OF 09	

X:\Metro North RR\18041 - Term Contract 100005008\Task 3- OSS # HAL -18-040-AL Scarsdale Station ACM and Lead Survey\18041-03_EPM Drawings\18041-03_EPM Sample Loc\18041-03_XRF Scarsdale DWGS02.dwg, 9/27/2018 3:07:46 P



EPM Environmental Planning & Management, Inc. www.epmco.com

DRAWN BY: MH/AR	DATE: SEPT. 2018		
CHECKED BY: MA	FILENAME: SCARSDALE STA		
APPR'VD BY: SG	SCALE: NOT TO SCALE		
PATH: X:\Metro North RR\18041-Term\Task 3 OSS# HAL -18-040-AL			

CLIENT: Metro-North Railroad, Office of System Safety, 420 Lexington Ave. Suite 930, New York, NY 10170

PROJECT NAME: DESIGN BUILD SERVICES FOR SCARSDALE AND HARTSDALE STATION IMPROVEMENTS

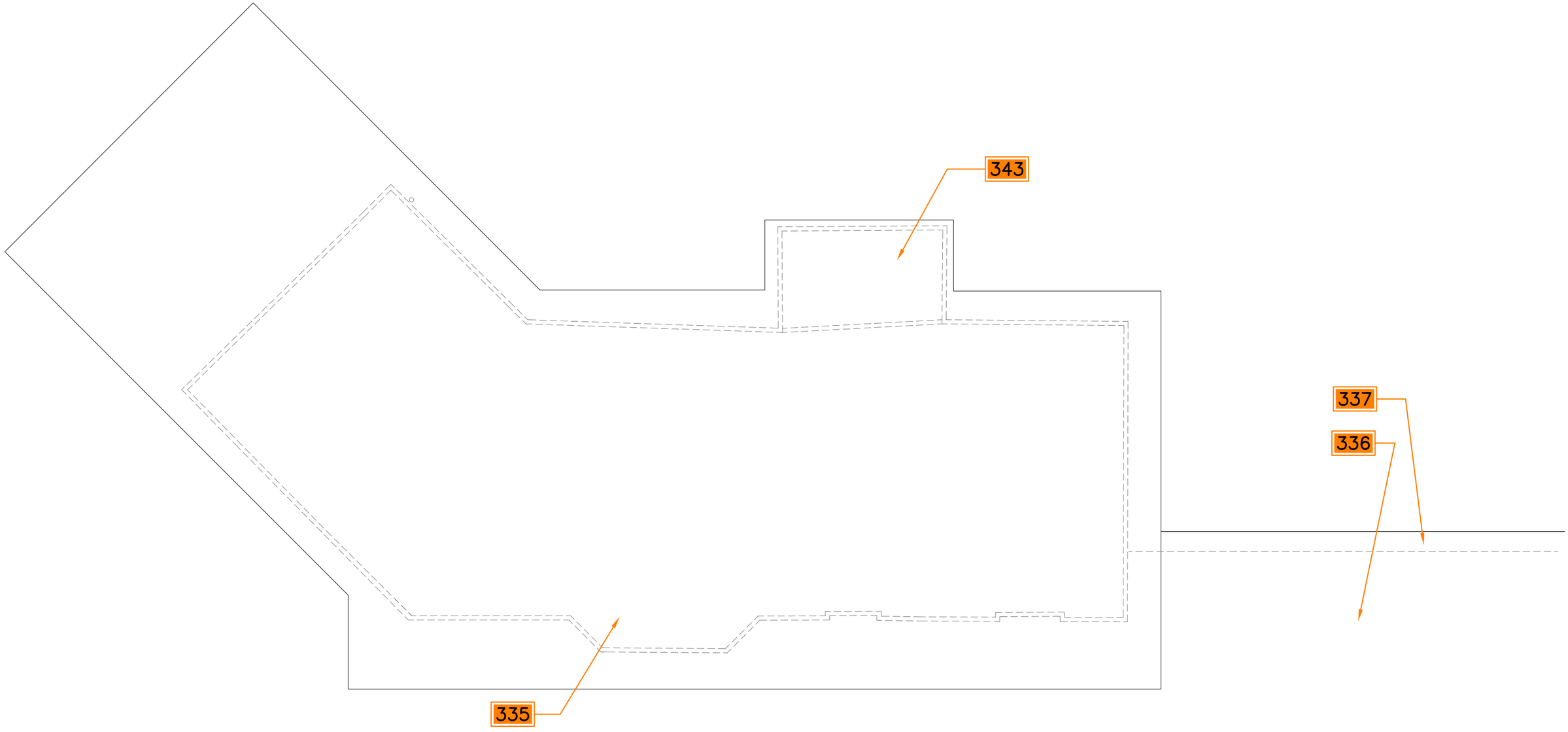
DRAWING NAME: GROUND FLOOR - BLDG ADJACENT TO STATION

PROJECT TITLE: SCARSDALE STATION, WESTCHESTER, NY
XRF SHOTS LOCATION SCHEMATIC

FIGURE NO: **XRF-08**

SHEET # 8 OF 9

X:\Metro North RR\18041 - Term Contract 100005008\Task 3- OSS # HAL -18-040-AL Scarsdale Station ACM and Lead Survey\18041-03_EPM Drawings\18041-03_EPM Sample Loc\18041-03_XRF Scarsdale DWGS02.dwg, 9/27/2018 6:09:18 PM



LEGEND:

XRF READING NO. LEAD RESULT
= 0.00 (NON-DETECTABLE LEAD)

XRF READING NO. LEAD RESULT
≥ 0.01 mg/cm² (LEAD CONTAINING)

EPM Environmental Planning & Management, Inc. www.epmco.com	DRAWN BY: MH/AR CHECKED BY: MA APPR'VD BY: SG PATH: X:\Metro North RR\18041-Term\Task 3 OSS# HAL -18-040-AL	DATE: SEPT. 2018 FILENAME: SCARSDALE STA SCALE: NOT TO SCALE	CLIENT: MTA Metro-North Railroad Office of System Safety 420 Lexington Ave. Suite 930 New York, NY 10170	PROJECT NAME: DESIGN BUILD SERVICES FOR SCARSDALE AND HARTSDALE STATION IMPROVEMENTS	DRAWING NAME: ROOF PLAN - BLDG. ADJACENT TO STATION PROJECT TITLE: SCARSDALE STATION, WESTCHESTER, NY XRF SHOTS LOCATION SCHEMATIC	FIGURE NO: **XRF-09** SHEET # 9 OF 9

APPENDIX D
Laboratory Accreditation

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2020
Issued April 01, 2019

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DIMITRIOS MOLOHIDES
ALPHA LABS LLC
14-26 28TH AVENUE
LONG ISLAND CITY, NY 11102

NY Lab Id No: 11833

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual
Asbestos-Vermiculite-Containing Material	Item 198.8 of Manual
Lead in Dust Wipes	EPA 7000B
Lead in Paint	ASTM D3335-85A

Sample Preparation Methods

	ASTM D3335-85A
	ASTM E-1644-17

Serial No.: 59860

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2019
Issued April 01, 2018

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Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. DIMITRIOS MOLOHIDES
ALPHA LABS LLC
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ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
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Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual
Asbestos-Vermiculite-Containing Material	Item 198.8 of Manual
Lead in Dust Wipes	EPA 7000B
Lead in Paint	ASTM D3335-85A

Sample Preparation Methods

	ASTM D3335-85A
	ASTM E-1644-04

Serial No.: 58001

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

APPENDIX E
Asbestos Bulk Sample Laboratory Analytical Data

alpha Labs
14-26 28th Avenue Long Island City, NY 11102
Tel.: (718) 482-7525 Fax: (718) 482-7524 www.alphalabsllc.com

BULK SAMPLE ANALYSIS REPORT

CLIENT: Environmental Planning & Management Inc., 1983 Marcus Avenue, Suite 109, Lake Success NY 11042
BUILDING ADDRESS: Metro North RR – Scarsdale Station, Scarsdale, Westchester, NY
PROJECT: 18041-03

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-1A 18-08-159-01	Grey caulk	Inbound platform, south end (1W-2W) at joint with stair	Grey Homogeneous NOB	32.7	32.9	34.3	0%	100%	NAD inconclusive	NAD
SD-1B 18-08-159-02	Grey caulk	Inbound platform, south end (1W-2W) at joint with stair	Grey Homogeneous NOB	42.8	31.8	25.4	0%	100%	NAD inconclusive	NAD
SD-1C 18-08-159-03	Grey caulk	Inbound platform, south end (1W-2W) at joint with stair	Grey Homogeneous NOB	43.0	32.8	24.2	0%	100%	NAD inconclusive	Analysis not requested by client
SD-2A 18-08-159-04	Blue/dark grey caulk	Inbound platform, south end (3W-4W) at joint with stair E2	Blue/Dk. Grey Homogeneous NOB	39.8	58.9	1.3	0%	100%	NAD inconclusive	NAD
SD-2B 18-08-159-05	Blue/dark grey caulk	Inbound platform, south end (3W-4W) at joint with stair E2	Blue/Dk. Grey Homogeneous NOB	39.4	59.5	1.1	0%	100%	NAD inconclusive	NAD
SD-2C 18-08-159-06	Blue/dark grey caulk	Inbound platform, south end (5W-6W) joint with Ramp E2	Blue/Dk. Grey Homogeneous NOB	39.5	58.3	2.2	0%	100%	NAD inconclusive	Analysis not requested by client
SD-3A 18-08-159-07	Brown joint filler	Inbound platform, south end (3W-4W) at joint with stair E2	Black Homogeneous NOB	90.0	8.7	1.3	0%	100%	NAD inconclusive	NAD
SD-3B 18-08-159-08	Brown joint filler	Inbound platform, south end (3W-4W) at joint with stair E2	Black Homogeneous NOB	88.9	3.6	7.4	0%	100%	NAD inconclusive	NAD
SD-3C 18-08-159-09	Brown joint filler	Inbound platform, south end (4W-5W) joint with Ramp E2	Black Homogeneous NOB	90.0	5.6	4.4	0%	100%	NAD inconclusive	Analysis not requested by client
SD-4A 18-08-159-10	Dark grey caulk	Inbound platform, base of column 2W, at platform	Dk. Grey Homogeneous NOB	50.4	48.3	1.3	0%	100%	NAD inconclusive	NAD
SD-4B 18-08-159-11	Dark grey caulk	Inbound platform, base of column 3W, at platform	Dk. Grey Homogeneous NOB	44.3	54.6	1.1	0%	100%	NAD inconclusive	NAD
SD-4C 18-08-159-12	Dark grey caulk	Inbound platform, base of column 4W, at platform	Dk. Grey Homogeneous NOB	44.2	54.6	1.2	0%	100%	NAD inconclusive	Analysis not requested by client

alpha Labs
14-26 28th Avenue Long Island City, NY 11102
Tel.: (718) 482-7525 Fax: (718) 482-7524 www.alphalabsllc.com

BULK SAMPLE ANALYSIS REPORT

CLIENT: Environmental Planning & Management Inc., 1983 Marcus Avenue, Suite 109, Lake Success NY 11042
BUILDING ADDRESS: Metro North RR – Scarsdale Station, Scarsdale, Westchester, NY
PROJECT: 18041-03

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-5A 18-08-159-13	Brown joint filler	Inbound platform, under rubber 1st joint from south	Dk. Brown Homogeneous NOB	66.5	30.8	2.6	0%	100%	NAD inconclusive	NAD
SD-5B 18-08-159-14	Brown joint filler	Inbound platform, under rubber 2nd joint from south	Dk. Brown Homogeneous NOB	65.9	6.2	27.9	0%	100%	NAD inconclusive	NAD
SD-5C 18-08-159-15	Brown joint filler	Inbound platform, under rubber 3rd joint from south	Dk. Brown Homogeneous NOB	78.2	19.0	2.7	0%	100%	NAD inconclusive	Analysis not requested by client
SD-6A 18-08-159-16	Brown rigid roof insulation	Inbound platform, south end of south canopy (1W-2W)	Dk. Brown Homogeneous Friable	Not Applicable			70% CELL	30%	NAD	
SD-6B 18-08-159-17	Brown rigid roof insulation	Inbound platform, south end of north canopy (17W)	Dk. Brown Homogeneous Friable	Not Applicable			70% CELL	30%	NAD	
SD-6C 18-08-159-18	Brown rigid roof insulation	Outbound platform, north end of canopy (19E-20E)	Dk. Brown Homogeneous Friable	Not Applicable			70% CELL	30%	NAD	
SD-7A 18-08-159-19	Black perimeter roof flashing tar	Inbound platform, south end of south canopy (1W-2W)	Black Homogeneous NOB	79.8	15.8	4.4	0%	100%	NAD inconclusive	NAD
SD-7B 18-08-159-20	Black perimeter roof flashing tar	Inbound platform, south end of north canopy (17W)	Black Homogeneous NOB	78.5	18.4	3.1	0%	100%	NAD inconclusive	NAD
SD-7C 18-08-159-21	Black perimeter roof flashing tar	Outbound platform, north end of canopy (19E-20E)	Black Homogeneous NOB	78.0	-0.1	22.2	0%	100%	NAD inconclusive	Analysis not requested by client
SD-8A 18-08-159-22	Brown rigid roof insulation	Inbound platform, south end of north canopy (17W)	Brown Homogeneous Friable	Not Applicable			75% CELL	25%	NAD	
SD-8B 18-08-159-23	Brown rigid roof insulation	Inbound platform, south end of north canopy (17W)	Brown Homogeneous Friable	Not Applicable			75% CELL	25%	NAD	
SD-8C 18-08-159-24	Brown rigid roof insulation	Outbound platform, north end of canopy (19E-20E)	Brown Homogeneous Friable	Not Applicable			75% CELL	25%	NAD	

alpha Labs
14-26 28th Avenue Long Island City, NY 11102
Tel.: (718) 482-7525 Fax: (718) 482-7524 www.alphalabsllc.com

BULK SAMPLE ANALYSIS REPORT

CLIENT: Environmental Planning & Management Inc., 1983 Marcus Avenue, Suite 109, Lake Success NY 11042
BUILDING ADDRESS: Metro North RR – Scarsdale Station, Scarsdale, Westchester, NY
PROJECT: 18041-03

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-9A 18-08-159-25	Black mastic/tar sealant	Inbound platform, center (7W-8W) at joint with stair E3	Black Homogeneous NOB	55.2	41.4	3.4	0%	100%	NAD inconclusive	NAD
SD-9B 18-08-159-26	Black mastic/tar sealant	Inbound platform, center (7W-8W) at joint with stair E3	Black Homogeneous NOB	55.6	39.0	5.5	0%	100%	NAD inconclusive	NAD
SD-9C 18-08-159-27	Black mastic/tar sealant	Inbound platform, center (7W-8W) at joint with stair E3	Black Homogeneous NOB	55.7	39.5	4.7	0%	100%	NAD inconclusive	Analysis not requested by client
SD-10A 18-08-159-28	Grey caulk	Inbound platform, base of light pole at 8W	Grey Homogeneous NOB	67.9	27.7	4.4	0%	100%	NAD inconclusive	NAD
SD-10B 18-08-159-29	Grey caulk	Inbound platform, base of light pole at 10W	Grey Homogeneous NOB	71.0	24.9	4.1	0%	100%	NAD inconclusive	NAD
SD-10C 18-08-159-30	Grey caulk	Outbound platform, base of light pole at 5E	Grey Homogeneous NOB	71.5	25.7	2.7	0%	100%	NAD inconclusive	Analysis not requested by client
SD-11A 18-08-159-31	Light grey caulk	Inbound platform, expansion joint at stair E4	Grey Homogeneous NOB	49.4	49.2	1.4	0%	100%	NAD inconclusive	NAD
SD-11B 18-08-159-32	Light grey caulk	Outbound platform, expansion joint at 12E	Grey Homogeneous NOB	50.7	47.3	2.0	0%	100%	NAD inconclusive	NAD
SD-11C 18-08-159-33	Light grey caulk	Inbound platform, expansion joint at stair E4	Grey Homogeneous NOB	46.7	50.5	2.8	0%	100%	NAD inconclusive	Analysis not requested by client
SD-12A 18-08-159-34	Light grey caulk	Inbound platform, drainage at underside of platform (5W)	Lt. Grey Homogeneous NOB	32.3	27.0	40.7	0%	100%	NAD inconclusive	NAD
SD-12B 18-08-159-35	Light grey caulk	Inbound platform, drainage at underside of platform (18W)	Lt. Grey Homogeneous NOB	36.3	34.1	29.5	0%	100%	NAD inconclusive	NAD
SD-12C 18-08-159-36	Light grey caulk	Outbound platform, drainage at underside of platform (13E)	Lt. Grey Homogeneous NOB	29.1	55.5	15.4	0%	100%	NAD inconclusive	Analysis not requested by client

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14-26 28th Avenue Long Island City, NY 11102
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BULK SAMPLE ANALYSIS REPORT

CLIENT: Environmental Planning & Management Inc., 1983 Marcus Avenue, Suite 109, Lake Success NY 11042
BUILDING ADDRESS: Metro North RR – Scarsdale Station, Scarsdale, Westchester, NY
PROJECT: 18041-03

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-13A 18-08-159-37	Dark gray caulk	Outbound platform, platform joint with stair btwn 5E-6E	Dk. Grey Homogeneous NOB	27.6	18.3	54.1	0%	100%	NAD inconclusive	NAD
SD-13B 18-08-159-38	Dark gray caulk	Outbound platform, platform joint with stair btwn 5E-6E	Dk. Grey Homogeneous NOB	42.5	32.5	25.0	0%	100%	NAD inconclusive	NAD
SD-13C 18-08-159-39	Dark gray caulk	Outbound platform, platform joint with stair btwn 5E-6E	Dk. Grey Homogeneous NOB	38.5	40.4	21.1	0%	100%	NAD inconclusive	Analysis not requested by client

Date Received: 8/21/18
Date of PLM Analysis: 8/22/18
Date of TEM Analysis: 8/22/18
Date of Report: 8/23/18

PLM Analyst: D. Molohides
TEM Analyst: A. Ansari

Analyst: _____
D. Molohides

QC Review / Date: _____
D. Molohides, Lab Director

NAD= No Asbestos Detected; NA/PS = Not Analyzed / Positive Stop; Trace = < 1%, CH = Chrysotile, AMO = Amosite, CRO = Crocidolite, ANTH = Anthophyllite, TRE = Tremolite, ACT = Actinolite, FBGL = Fiberglass, CELL = Cellulose, SYNTH = Synthetic fibers, VERM = Vermiculite, WOLL = Wollastonite. Polarized Light Microscopy (PLM) analysis of samples is performed by Method EPA 600/M4-82-020 and ELAP PLM Analysis Protocol 198.1 (friable samples) and protocol 198.6 (NOB samples). Transmission Electron Microscopy (TEM) analysis of samples is performed by Method ELAP TEM Analysis Protocol 198.4. This report includes the identification and quantitation of vermiculite as required by current NYS-DOH ELAP protocols & interim guidance letters. Analytical equipments: Stereobinocular microscopes: Professional Bin (PM #1), Accuscope (Ser# 1200608), Carlsan (Ser# 011418); Polarized Light Microscopes: Olympus BH-2 (Ser #: 214335), Olympus BH-2 (Ser #: 236532). PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing. Samples will be stored for sixty (60) days and then returned to the client upon request. The results relate only to the items calibrated or tested. This report may not be reproduced, except in full, without the written approval of Alpha Labs LLC. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the US Government. This report contains data (bulk asbestos TEM results) that are not covered by the NVLAP accreditation. The liability of Alpha Labs LLC with respect to the services charged shall in no event exceed the amount of the invoice. **(November 1, 2016)**

NYS-DOH ELAP # 11833 **NVLAP Lab Code: 200691-0**

Bulk Sample Form

18.08.159

EPM
Environmental Planning & Management, Inc.
www.epmco.com

1983 Marcus Avenue, Suite 109 | Lake Success | New York 11040
P. 516.328.1194 | F. 516.328.1381

2125 Center Avenue, Suite 404 | Fort Lee | New Jersey 07024
P. 201.363.1983 | F. 201.363.0800

RESULTS NEEDED: 48 Hour TAT

SEND ALL RESULTS BY EMAIL TO : Mike Aprahamian (maprahamian@epmco.com); Darren Frank (dfrank@epmco.com)

FOLLOW-UP ALL FAXES WITH HARDCOPY BY MAIL TO EPM

SHIPPED BY: Hand Delivered

PROJECT INFORMATION			
CLIENT :	Metro North RR		
EPM # :	18041-03	DATE :	8/21/2018
Project:	Station Improvements - (MNR OSS Task #HAL-18-040)		
Project Location:	ScarsdaleStation: Scarsdale, Westchester NY		

LABORATORY NOTE : Analyze by layer via PLM with positive stop.

If negative by PLM and NOB, analyze by TEM only first two (2) samples.

SAMPLE NUMBER	DATE SAMPLED	SAMPLE LOCATION	MATERIAL DESCRIPTION
SD-01A	8/15/2018	Inbound platform, south end (1W-2W) at joint with stair	Grey caulk
SD-01B		Inbound platform, south end (1W-2W) at joint with stair	Grey caulk
SD-01C		Inbound platform, south end (1W-2W) at joint with stair	Grey caulk
SD-02A		Inbound platform, south end (3W-4W) at joint with stair E2	Blue/dark gray caulk
SD-02B		Inbound platform, south end (3W-4W) at joint with stair E2	Blue/dark gray caulk
SD-02C		Inbound platform, south end (5W-6W) joint with Ramp E2	Blue/dark gray caulk
SD-03A		Inbound platform, south end (3W-4W) at joint with stair E2	Brown joint filler
SD-03B		Inbound platform, south end (3W-4W) at joint with stair E2	Brown joint filler
SD-03C		Inbound platform, south end (4W-5W) joint with Ramp E2	Brown joint filler
SD-04A		Inbound platform, base of column 2W, at platform	Dark gray caulk
SD-04B		Inbound platform, base of column 3W, at platform	Dark gray caulk
SD-04C		Inbound platform, base of column 4W, at platform	Dark gray caulk
SD-05A		Inbound platform, under rubber 1st joint from south	Brown joint filler
SD-05B		Inbound platform, under rubber 2nd joint from south	Brown joint filler
SD-05C		Inbound platform, under rubber 3rd joint from south	Brown joint filler
SD-06A		Inbound Platform, south end of south canopy (1W-2W)	Brown ridgid roof insulation
SD-06B		Inbound platform, south end of north canopy (17W)	Brown ridgid roof insulation
SD-06C		Outbound platform, north end of canopy (19E-20E)	Brown ridgid roof insulation

Sampler's Relinquishment Signature Date / Time:

8/21/2018

Lab Receipt Signature / Date / Time:

AP 8/21/18

BULK SAMPLE FORM

18·08·159

PAGE_2_ OF_2_

EPM
Environmental Planning & Management, Inc.
www.epmco.com

1983 Marcus Avenue, Suite 109 | Lake Success | New York 11040
P. 516.328.1194 | F. 516.328.1381

2125 Center Avenue, Suite 404 | Fort Lee | New Jersey 07024
P. 201.363.1983 | F. 201.363.0800

RESULTS NEEDED: 48 Hour TAT

SEND ALL RESULTS BY EMAIL TO : Mike Aprahamian (maprahamian@epmco.com); Darren Frank (dfrank@epmco.com)

FOLLOW-UP ALL FAXES WITH HARDCOPY BY MAIL TO EPM

SHIPPED BY: Hand Delivered

PROJECT INFORMATION			
CLIENT :	Metro North RR		
EPM # :	18041-03	DATE :	8/21/2018
Project:	Station Improvements - (MNR OSS Task #HAL-18-040)		
Project Location:	ScarsdaleStation: Scarsdale, Westchester NY		

LABORATORY NOTE : Analyze by layer via PLM with positive stop.

If negative by PLM and NOB, analyze by TEM only first two (2) samples.

SAMPLE NUMBER	DATE SAMPLED	SAMPLE LOCATION	MATERIAL DESCRIPTION
SD-07A	8/15/2018	Inbound Platform, south end of south canopy (1W-2W)	Black perimeter roof flashing tar
SD-07B		Inbound platform, south end of north canopy (17W)	Black perimeter roof flashing tar
SD-07C		Outbound platform, north end of canopy (19E-20E)	Black perimeter roof flashing tar
SD-08A		Inbound platform, south end of north canopy (17W)	Brown ridgid roof insulation
SD-08B		Inbound platform, south end of north canopy (17W)	Brown ridgid roof insulation
SD-08C		Outbound platform, north end of canopy (19E-20E)	Brown ridgid roof insulation
SD-09A	8/16/2018	Inbound platform, center (7W-8W) at joint with stair E3	Black mastic/tar selant
SD-09B		Inbound platform, center (7W-8W) at joint with stair E3	Black mastic/tar selant
SD-09C		Inbound platform, center (7W-8W) at joint with stair E3	Black mastic/tar selant
SD-10A		Inbound platform, base of light pole at 8W	Gray caulk
SD-10B		Inbound platform, base of light pole at 10W	Gray caulk
SD-10C		Outnbound platform, base of light pole at 5E	Gray caulk
SD-11A		Inbound platform, expansion joint at stair E4	Light gray caulk
SD-11B		Outbound platform, expansion joint at 12E	Light gray caulk
SD-11C		Inbound platform, expansion joint at stair E4	Light gray caulk
SD-12A		Inbound platform, around drainage at underside of platform (5W)	Light gray caulk
SD-12B		Inbound platform, around drainage at underside of platform (18W)	Light gray caulk
SD-12C		Outbound platform, around drainage at underside of platform (13E)	Light gray caulk
SD-13A		Outbound platform, platform joint with stair btwn 5E-6E	Dark gray caulk
SD-13B		Outbound platform, platform joint with stair btwn 5E-6E	Dark gray caulk
SD-13C		Outbound platform, platform joint with stair btwn 5E-6E	Dark gray caulk

Sampler's Relinquishment Signature / Date / Time:

8/21/2018

Lab Receipt Signature / Date / Time:

AP 8/21/18

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BULK SAMPLE ANALYSIS REPORT

CLIENT: Environmental Planning & Management Inc., 1983 Marcus Avenue, Suite 109, Lake Success NY 11042
BUILDING ADDRESS: Metro North RR – Scarsdale Station: Scarsdale, Westchester, NY
PROJECT: 18041-03

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-14A 18-08-222-01	White caulk	Station building- perimeter of stucco panels- W- NW side	White Homogeneous NOB	32.0	66.7	1.3	0%	100%	NAD inconclusive	NAD
SD-14B 18-08-222-02	White caulk	Station building- perimeter of stucco panels - North side	White Homogeneous NOB	30.4	67.7	1.9	0%	100%	NAD inconclusive	NAD
SD-14C 18-08-222-03	White caulk	Station building - perimeter of stucco panels- SE corner	White Homogeneous NOB	31.2	51.6	17.2	0%	100%	NAD inconclusive	Analysis not requested by client
SD-15A 18-08-222-04	White/gray stucco material	Station building - W-southwest elevation panel	Beige/Grey Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-15B 18-08-222-05	White/gray stucco material	Station building - East-southeast elevation panel	Beige/Grey Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-15C 18-08-222-06	White/gray stucco material	Station building - West elevation, south of Gen. Building	Beige/Grey Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-16A 18-08-222-07	White putty	Station building - Window sash - west-southwest (exterior)	White Homogeneous NOB	11.1	83.4	5.5	0%	100%	NAD inconclusive	Trace ANTH
SD-16B 18-08-222-08	White putty	Station building - Window sash - west-northwest (exterior)	White Homogeneous NOB	12.1	83.7	4.3	0%	100%	NAD inconclusive	Trace ANTH
SD-16C 18-08-222-09	White putty	Station building - Window sash - west-southeast (exterior)	White Homogeneous NOB	15.2	79.0	5.9	0%	100%	NAD inconclusive	Analysis not requested by client
SD-17A 18-08-222-10	Gray caulk	Station building - drain pipe connection SW corner	Lt. Grey Homogeneous NOB	73.1	25.1	1.8	0%	100%	NAD inconclusive	NAD
SD-17B 18-08-222-11	Gray caulk	Station building - drain pipe connection, west side	Lt. Grey Homogeneous NOB	73.6	24.7	1.6	0%	100%	NAD inconclusive	NAD
SD-17C 18-08-222-12	Gray caulk	Station building - drain pipe connection South - SE corner	Lt. Grey Homogeneous NOB	73.2	24.7	2.1	0%	100%	NAD inconclusive	Analysis not requested by client

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BULK SAMPLE ANALYSIS REPORT

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BUILDING ADDRESS: Metro North RR – Scarsdale Station: Scarsdale, Westchester, NY
PROJECT: 18041-03

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-18A 18-08-222-13	Black caulk	Station building - drain pipe connection, east-southeast corner	Black Homogeneous NOB	55.9	30.7	13.5	0%	100%	NAD inconclusive	NAD
SD-18B 18-08-222-14	Black caulk	Station building - drain pipe connection, east southeast corner	Black Homogeneous NOB	57.3	29.1	13.6	0%	100%	NAD inconclusive	NAD
SD-18C 18-08-222-15	Black caulk	Station building - drain pipe connection west-northwest corner	Black Homogeneous NOB	57.7	32.5	9.8	0%	100%	NAD inconclusive	Analysis not requested by client
SD-19A 18-08-222-16	Light Grey caulk	Generator exhaust conduit penetration at shelter	Off-White Homogeneous NOB	38.7	58.2	3.1	0%	100%	NAD inconclusive	NAD
SD-19B 18-08-222-17	Light Grey caulk	Generator exhaust conduit penetration at shelter	Off-White Homogeneous NOB	35.4	62.3	2.3	0%	100%	NAD inconclusive	NAD
SD-19C 18-08-222-18	Light Grey caulk	Generator exhaust conduit penetration at shelter	Off-White Homogeneous NOB	35.4	62.8	1.8	0%	100%	NAD inconclusive	Analysis not requested by client
SD-20A 18-08-222-19	Black with white dots insulation material	Terra-Cotta tiles canopy northeast corner of building	Black/White Homogeneous NOB	85.8	9.7	4.5	0%	100%	NAD inconclusive	NAD
SD-20B 18-08-222-20	Black with white dots insulation material	Terra-Cotta roof joint between shelter roof and building wall	Black/White Homogeneous NOB	83.9	5.0	11.1	0%	100%	NAD inconclusive	NAD
SD-20C 18-08-222-21	Black with white dots insulation material	Terra-Cotta canopy northeast corner of building	Black/White Homogeneous NOB	88.7	8.0	3.3	0%	100%	NAD inconclusive	Analysis not requested by client
SD-21A 18-08-222-22	Tar paper material	Beneath Terra-Cotta tiles and roof - NE corner	Black Homogeneous NOB	94.7	3.3	2.0	0%	100%	NAD inconclusive	NAD
SD-21B 18-08-222-23	Tar paper material	Beneath Terra-Cotta tiles and roof - NE corner	Black Homogeneous NOB	95.2	0.2	4.6	0%	100%	NAD inconclusive	NAD
SD-21C 18-08-222-24	Tar paper material	Beneath Terra-Cotta tiles and roof - beyond the station building	Black Homogeneous NOB	88.8	9.7	1.4	0%	100%	NAD inconclusive	Analysis not requested by client

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BULK SAMPLE ANALYSIS REPORT

CLIENT: Environmental Planning & Management Inc., 1983 Marcus Avenue, Suite 109, Lake Success NY 11042
BUILDING ADDRESS: Metro North RR – Scarsdale Station: Scarsdale, Westchester, NY
PROJECT: 18041-03

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-22A 18-08-222-25	Beige floor tile with yellow blue (inseparable)	Station building interior, ticket office – bottom layer	Beige Homogeneous NOB	14.9	83.6	1.5	0%	100%	NAD inconclusive	NAD
SD-22B 18-08-222-26	Beige floor tile with yellow blue (inseparable)	Station building interior, ticket office – bottom layer	Beige Homogeneous NOB	15.5	83.4	1.1	0%	100%	NAD inconclusive	NAD
SD-22C 18-08-222-27	Beige floor tile with yellow blue (inseparable)	Station building interior, ticket office – bottom layer	Beige Homogeneous NOB	19.8	78.7	1.5	0%	100%	NAD inconclusive	Analysis not requested by client
SD-23A 18-08-222-28	12"x12" brown floor tile brown specs (with glue inseparable)	Station building interior, ticket office – bottom layer	Brown/Beige Homogeneous NOB	11.1	85.5	3.4	0%	100%	NAD inconclusive	NAD
SD-23B 18-08-222-29	12"x12" brown floor tile brown specs (with glue inseparable)	Station building interior, ticket office – bottom layer	Brown/Beige Homogeneous NOB	9.4	86.6	4.0	0%	100%	NAD inconclusive	NAD
SD-23C 18-08-222-30	12"x12" brown floor tile brown specs (with glue inseparable)	Station building interior, ticket office – bottom layer	Brown/Beige Homogeneous NOB	8.5	87.9	3.6	0%	100%	NAD inconclusive	Analysis not requested by client
SD-24A 18-08-222-31	Gray concrete/plaster board	Station building interior, ticket office – east wall	Grey Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-24B 18-08-222-32	Gray concrete/plaster board	Station building interior, ticket office – east wall	Grey Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-24C 18-08-222-33	Gray concrete/plaster board	Station building interior, ticket office – east wall	Grey Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-25A 18-08-222-34	Gypsum board	Station building interior: Boiler Room, east wall	Off-W/Brown Homogeneous Friable	Not Applicable			10% CELL 2% FBGL	88%	NAD	
SD-25B 18-08-222-35	Gypsum board	Station building interior: Boiler Room, east wall	Off-W/Brown Homogeneous Friable	Not Applicable			20% CELL 3% FBGL	77%	NAD	
SD-25C 18-08-222-36	Gypsum board	Station building interior: Boiler Room, south wall	Off-W/Brown Homogeneous Friable	Not Applicable			8% CELL 2% FBGL	90%	NAD	

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BULK SAMPLE ANALYSIS REPORT

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BUILDING ADDRESS: Metro North RR – Scarsdale Station: Scarsdale, Westchester, NY
PROJECT: 18041-03

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-26A1 18-08-222-37	Joint compound	Station building interior: Boiler Room, east wall	White Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-26B1 18-08-222-38	Joint compound	Station building interior: Boiler Room, east wall	White Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-26C1 18-08-222-39	Joint compound	Station building interior: Boiler Room, south wall	White Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-26A2 18-08-222-40	Gypsum board tape	Station building interior: Boiler Room, east wall	Beige Homogeneous Friable	Not Applicable			95% CELL	5%	NAD	
SD-26B2 18-08-222-41	Gypsum board tape	Station building interior: Boiler Room, east wall	Beige Homogeneous Friable	Not Applicable			95% CELL	5%	NAD	
SD-26C2 18-08-222-42	Gypsum board tape	Station building interior: Boiler Room, south wall	Beige Homogeneous Friable	Not Applicable			95% CELL	5%	NAD	
SD-27A 18-08-222-43	12" x 12" Beige floor tile with glue (inseparable)	Station building interior: Boiler Room, east side	Beige Homogeneous NOB	11.6	86.4	1.9	0%	100%	NAD inconclusive	NAD
SD-27B 18-08-222-44	12" x 12" Beige floor tile with glue (inseparable)	Station building interior: Boiler Room, west side	Beige Homogeneous NOB	12.0	86.8	1.2	0%	100%	NAD inconclusive	NAD
SD-27C 18-08-222-45	12" x 12" Beige floor tile with glue (inseparable)	Station building interior: Boiler Room, west side	Beige Homogeneous NOB	13.9	84.4	1.7	0%	100%	NAD inconclusive	Analysis not requested by client
SD-28A1 18-08-222-46	Black mastic	Station building interior: Corridor threshold between boiler room (beneath 5/8" plywood and ceramic floor tiles)	Black Homogeneous NOB	60.4	38.4	1.2	0%	100%	NAD inconclusive	NAD
SD-28A2 18-08-222-47	Green Floor tile		Green Homogeneous NOB	55.0	36.1	8.9	0%	100%	NAD inconclusive	NAD
SD-28B1 18-08-222-48	Black Mastic		Black Homogeneous NOB	61.5	37.3	1.2	0%	100%	NAD inconclusive	NAD

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BUILDING ADDRESS: Metro North RR – Scarsdale Station: Scarsdale, Westchester, NY
PROJECT: 18041-03

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-28B2 18-08-222-49	Green Floor tile	Station building interior: Corridor threshold between boiler room (beneath 5/8" plywood and ceramic floor tiles)	Green Homogeneous NOB	61.4	32.6	6.0	0%	100%	NAD inconclusive	NAD
SD-28C1 18-08-222-50	Black Mastic		Black Homogeneous NOB	61.8	35.9	2.3	0%	100%	NAD inconclusive	Analysis not requested by client
SD-28C2 18-08-222-51	Green Floor tile		Green Homogeneous NOB	70.2	17.5	12.3	0%	100%	NAD inconclusive	Analysis not requested by client
SD-29A 18-08-222-52	Floor tile - mortar	Station building interior: corridor boiler room threshold	Dk. Grey Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-29B 18-08-222-53	Floor tile - mortar	Station building interior: corridor boiler room threshold	Dk. Grey Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-29C 18-08-222-54	Floor tile - mortar	Station building interior: corridor boiler room threshold	Dk. Grey Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-30A 18-08-222-55	Floor tile - grout	Station building interior: corridor boiler room threshold	Brown Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-30B 18-08-222-56	Floor tile - grout	Station building interior: corridor boiler room threshold	Brown Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-30C 18-08-222-57	Floor tile - grout	Station building interior: corridor boiler room threshold	Brown Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-31A 18-08-222-58	Green mortar	Station Pedestrian overpass canopy (at staircase): beneath Terra-cotta tiles (openings)	Green Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-31B 18-08-222-59	Green mortar		Green Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-31C 18-08-222-60	Green mortar		Green Homogeneous Friable	Not Applicable			0%	100%	NAD	

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Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-32A 18-08-222-61	Tar paper material	Pedestrian Overpass Canopy Beneath Terra-Cotta tiles - outbound side	Black Homogeneous NOB	91.8	3.9	4.3	0%	100%	NAD inconclusive	NAD
SD-32B 18-08-222-62	Tar paper material		Black Homogeneous NOB	93.7	3.5	2.7	0%	100%	NAD inconclusive	NAD
SD-32C 18-08-222-63	Tar paper material		Black Homogeneous NOB	94.0	2.5	3.4	0%	100%	NAD inconclusive	Analysis not requested by client
SD-33A 18-08-222-64	2' x 2' suspended Gypsum ceiling panel (material is sheetrock)	Station building interior: Concession Room ceiling - center	Off-W/Brown Homogeneous Friable	Not Applicable			8% CELL 2% FBGL	90%	NAD	
SD-33B 18-08-222-65	2' x 2' suspended Gypsum ceiling panel (material is sheetrock)	Station building interior: Concession Room ceiling - center	Off-W/Brown Homogeneous Friable	Not Applicable			25% CELL 2% FBGL	73%	NAD	
SD-33C 18-08-222-66	2' x 2' suspended Gypsum ceiling panel (material is sheetrock)	Station building interior: Concession Room ceiling - SW	Off-W/Brown Homogeneous Friable	Not Applicable			15% CELL 3% FBGL	82%	NAD	
SD-34A 18-08-222-67	Gypsum board material	Station building interior: Cellar ceiling near north wall	Beige/Brown Homogeneous Friable	Not Applicable			45% CELL	55%	NAD	
SD-34B 18-08-222-68	Gypsum board material	Station building interior: Cellar ceiling near east wall	Beige/Brown Homogeneous Friable	Not Applicable			15% CELL	85%	NAD	
SD-34C 18-08-222-69	Gypsum board material	Station building interior: Cellar ceiling near west wall	Beige/Brown Homogeneous Friable	Not Applicable			30% CELL	70%	NAD	

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CLIENT: Environmental Planning & Management Inc., 1983 Marcus Avenue, Suite 109, Lake Success NY 11042
BUILDING ADDRESS: Metro North RR – Scarsdale Station: Scarsdale, Westchester, NY
PROJECT: 18041-03

Date Received: 8/30/18
Date of PLM Analysis: 9/01/18
Date of TEM Analysis: 9/04/18
Date of Report: 9/04/18

PLM Analyst: D. Molohides
TEM Analyst: A. Ansari

Analyst: _____
D. Molohides

QC Review / Date: _____
D. Molohides, Lab Director

NAD= No Asbestos Detected; NA/PS = Not Analyzed / Positive Stop; Trace = < 1%, CH = Chrysotile, AMO = Amosite, CRO = Crocidolite, ANTH = Anthophyllite, TRE = Tremolite, ACT = Actinolite, FBGL = Fiberglass, CELL = Cellulose, SYNTH = Synthetic fibers, VERM = Vermiculite, WOLL = Wollastonite. Polarized Light Microscopy (PLM) analysis of samples is performed by Method EPA 600/M4-82-020 and ELAP PLM Analysis Protocol 198.1 (friable samples) and protocol 198.6 (NOB samples). Transmission Electron Microscopy (TEM) analysis of samples is performed by Method ELAP TEM Analysis Protocol 198.4. This report includes the identification and quantitation of vermiculite as required by current NYS-DOH ELAP protocols & interim guidance letters. Analytical equipments: Stereobinocular microscopes: Professional Bin (PM #1), Accuscope (Ser# 1200608), Carlsan (Ser# 011418); Polarized Light Microscopes: Olympus BH-2 (Ser #: 214335), Olympus BH-2 (Ser #: 236532). PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing. Samples will be stored for sixty (60) days and then returned to the client upon request. The results relate only to the items calibrated or tested. This report may not be reproduced, except in full, without the written approval of Alpha Labs LLC. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the US Government. This report contains data (bulk asbestos TEM results) that are not covered by the NVLAP accreditation. The liability of Alpha Labs LLC with respect to the services charged shall in no event exceed the amount of the invoice. **(November 1, 2016)**

NYS-DOH ELAP # 11833 **NVLAP Lab Code: 200691-0**

Bulk Sample Form

18-08-222

EPM
Environmental Planning & Management, Inc.
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2125 Center Avenue, Suite 404 | Fort Lee | New Jersey 07024
P. 201.363.1983 | F. 201.363.0800

RESULTS NEEDED: 48 Hour TAT

SEND ALL RESULTS BY EMAIL TO : Mike Aprahamian (maprahamian@epmco.com); Darren Frank (dfrank@epmco.com)

FOLLOW-UP ALL FAXES WITH HARDCOPY BY MAIL TO EPM

SHIPPED BY: Hand Delivered

PROJECT INFORMATION			
CLIENT :	Metro North RR		
EPM # :	18041-03	DATE :	8/29/2018
Project:	Station Improvements - (MNR OSS Task #HAL-18-040)		
Project Location:	Scarsdale Station: Scarsdale, Westchester NY		

LABORATORY NOTE : Analyze by layer via PLM with positive stop.

If negative by PLM and NOB, analyze by TEM only first two (2) samples.

SAMPLE NUMBER	DATE SAMPLED	SAMPLE LOCATION	MATERIAL DESCRIPTION
SD-14A	8/28/2018	Station building- perimeter of stucco panels - West-NW side	White caulk
SD-14B		Station building- perimeter of stucco panels - North side	White caulk
SD-14C		Station building - perimeter of stucco panels- Southeast corner	White caulk
SD-15A		Station building - W-southwest elevation panel	White/gray stucco material
SD-15B		Station building - East-southeast elevation panel	White/gray stucco material
SD-15C		Station building - West elevation, south of Gen. Building	White/gray stucco material
SD-16A		Station building - Window sash - west-southwest (exterior)	White putty
SD-16B		Station building - Window sash - west-northwest (exterior)	White putty
SD-16C		Station building - Window sash - west-southeast (exterior)	White putty
SD-17A		Station building - drain pipe connection SW corner	Gray caulk
SD-17B		Station building - drain pipe connection, west side	Gray caulk
SD-17C		Station building - drain pipe connection ,south - southeast corner	Gray caulk
SD-18A		Station building - drain pipe connection, east-southeast corner	Black caulk
SD-18B		Station building - drain pipe connection, east southeast corner	Black caulk
SD-18C		Station building - drain pipe connection ,west-northwest corner	Black caulk
SD-19A		Generator exhaust conduit penetration at shelter	Light Gray caulk
SD-19B			
SD-19C			
SD-20A		Terra-Cotta tiles canopy northeast corner of building	Black with white dots insulation material
SD-20B		Terra-Cotta roof joint between shelter roof and building wall	Black with white dots insulation material
SD-20C		Terra-Cotta canopy northeast corner of building	Black with white dots insulation material

Sampler's Relinquishment Signature Date / Time:

8/29/18 3:00 pm

Lab Receipt Signature / Date / Time:

AP 8/30/18

BULK SAMPLE FORM 18-08-222

EPM
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PROJECT INFORMATION			
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Project Location:	Scarsdale Station: Scarsdale, Westchester NY		

LABORATORY NOTE : Analyze by layer via PLM with positive stop.

If negative by PLM and NOB, analyze by TEM only first two (2) samples.

SAMPLE NUMBER	DATE SAMPLED	SAMPLE LOCATION	MATERIAL DESCRIPTION
SD-21A	8/28/2018	Beneath Terra-Cotta tiles and roof - NE corner	Tar paper material
SD-21B		Beneath Terra-Cotta tiles and roof - NE corner	Tar paper material
SD-21C		Beneath Terra-Cotta tiles and roof - beyond the station building	Tar paper material
SD-22A		Station building interior: Ticket office -bottom layer	Beige floor tile with yellow blue (inseparable)
SD-22B			
SD-22C			
SD-23A		Station building interior: Ticket office -bottom layer	12" x 12" Brown floor tile with brown specs (with glue inseparable)
SD-23B			
SD-23C			
SD-24A		Station building interior Ticket office east wall	Gray concrete/plaster board
SD-24B			Gray concrete/plaster board
SD-24C			Gray concrete/plaster board
SD-25A		Station building interior: Boiler Room, east wall	Gypsum board
SD-25B		Station building interior: Boiler Room, east wall	Gypsum board
SD-25C		Station building interior: Boiler Room, south wall	Gypsum board
SD-26A		Station building interior: Boiler Room, east wall	Joint compound/tape
SD-26B		Station building interior: Boiler Room, east wall	Joint compound/tape
SD-26C		Station building interior: Boiler Room, south wall	Joint compound/tape
SD-27A		Station building interior: Boiler Room, east side	12" x 12" Beige floor tile with glue (inseparable)
SD-27B		Station building interior: Boiler Room, west side	12" x 12" Beige floor tile with glue (inseparable)
SD-27C		Station building interior: Boiler Room, west side	12" x 12" Beige floor tile with glue (inseparable)

Sampler's Relinquishment Signature / Date / Time: 8/29/18 3:00 PM

Lab Receipt Signature / Date / Time: AP 8/30/18

BULK SAMPLE FORM 18-08-222

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RESULTS NEEDED: 48 Hour TAT

SEND ALL RESULTS BY EMAIL TO : Mike Aprahamian (maprahamian@epmco.com); Darren Frank (dfrank@epmco.com)

FOLLOW-UP ALL FAXES WITH HARDCOPY BY MAIL TO EPM

SHIPPED BY: Hand Delivered

PROJECT INFORMATION			
CLIENT :	Metro North RR		
EPM # :	18041-03	DATE :	8/29/2018
Project:	Station Improvements - (MNR OSS Task #HAL-18-040)		
Project Location:	Scarsdale Station: Scarsdale, Westchester NY		

LABORATORY NOTE : Analyze by layer via PLM with positive stop.

If negative by PLM and NOB, analyze by TEM only first two (2) samples.

SAMPLE NUMBER	DATE SAMPLED	SAMPLE LOCATION	MATERIAL DESCRIPTION
SD-28A.1	8/28/2018	Station building interior: Corridor threshold between boiler room (beneath 5/8" plywood and ceramic floor tiles	Black mastic
SD-28A.2			Green Floor tile
SD-28B.1			Black Mastic
SD-28B.2			Green Floor tile
SD-28C.1			Black Mastic
SD-28C.2			Green Floor tile
SD-29A		Station building interior: corridor boiler room threshold	Floor tile - mortar
SD-29B			Floor tile - mortar
SD-29C			Floor tile - mortar
SD-30A		Station building interior: corridor boiler room threshold	Floor tile - grout
SD-30B			Floor tile - grout
SD-30C			Floor tile - grout
SD-31A		Station Pedestrian overpass canopy (at staircase): beneath Terra-cotta tiles (openings)	Green mortar
SD-31B			Green mortar
SD-31C			Green mortar
SD-32A		Pedestrian Overpass Canopy Beneath Terra-Cotta tiles - outbound side	Tar paper material
SD-32B			Tar paper material
SD-32C			Tar paper material
SD-33A		Station building interior: Concession Room ceiling - center	2' x 2' suspended Gypsum ceiling panel
SD-33B		Station building interior: Concession Room ceiling - center	
SD-33C		Station building interior: Concession Room ceiling - SW	
SD-34A		Station building interior: Cellar ceiling near north wall	Gypsum board material
SD-34B		Station building interior: Cellar ceiling near east wall	
SD-34C		Station building interior: Cellar ceiling near west wall	

Sampler's Relinquishment Signature / Date / Time: 8/29/18 3:00 PM

Lab Receipt Signature / Date / Time: AP 8/30/18

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BULK SAMPLE ANALYSIS REPORT

CLIENT: Environmental Planning & Management Inc., 1983 Marcus Avenue, Suite 109, Lake Success NY 11042
BUILDING ADDRESS: Metro North RR – **Scarsdale Station** – Scarsdale, Westchester, NY
PROJECT: 18041-03 Station Improvements- (MNR OSS Task # HAL-18-040)

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-35A 18-09-092-01	Brown Paper door insulation	Oil room shelter door	Brown Homogeneous Friable	Not Applicable			100% CELL	0%	NAD	
SD-35B 18-09-092-02	Brown Paper door insulation	Door between ticket office and boiler room	Brown Homogeneous Friable	Not Applicable			100% CELL	0%	NAD	
SD-35C 18-09-092-03	Brown Paper door insulation	Boiler room door	Brown Homogeneous Friable	Not Applicable			100% CELL	0%	NAD	
SD-36A 18-09-092-04	Black backing board material	Elevator Machine Room backing inside relay cabinet	Black Homogeneous NOB	98.5	0.4	1.1	0%	100%	NAD inconclusive	NAD
SD-36B 18-09-092-05	Black backing board material	Elevator Machine Room backing inside relay cabinet	Black Homogeneous NOB	98.5	0.3	1.2	0%	100%	NAD inconclusive	NAD
SD-36C 18-09-092-06	Black backing board material	Elevator Machine Room backing inside relay cabinet	Black Homogeneous NOB	98.4	0.3	1.3	0%	100%	NAD inconclusive	Analysis not requested by client
SD-37A 18-09-092-07	Light gray plaster ceiling	Attic space, ceiling above corridor	Off White Homogeneous Friable	Not Applicable			5% HAIR	95%	NAD	
SD-37B 18-09-092-08	Light gray plaster ceiling	Attic space, ceiling above corridor	Off White Homogeneous Friable	Not Applicable			4% HAIR	96%	NAD	
SD-37C 18-09-092-09	Light gray plaster ceiling	Attic space, ceiling above corridor	Off White Homogeneous Friable	Not Applicable			3% HAIR	97%	NAD	
SD-37D 18-09-092-10	Light gray plaster ceiling	Attic space, above ticket office	Off White Homogeneous Friable	Not Applicable			4% HAIR	96%	NAD	
SD-37E 18-09-092-11	Light gray plaster ceiling	Attic space, above men's room	Off White Homogeneous Friable	Not Applicable			3% HAIR	97%	NAD	
SD-38A 18-09-092-12	12"x12" black floor tile and adhesive (inseparable)	Concession room: flooring east side near door	Black Homogeneous NOB	25.6	71.4	3.0	0%	100%	NAD inconclusive	NAD

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BUILDING ADDRESS: Metro North RR – **Scarsdale Station** – Scarsdale, Westchester, NY
PROJECT: 18041-03 Station Improvements- (MNR OSS Task # HAL-18-040)

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-38B 18-09-092-13	12"x12" black floor tile and adhesive (inseparable)	Concession room: flooring southeast corner near closet	Black Homogeneous NOB	32.6	63.6	3.8	0%	100%	NAD inconclusive	NAD
SD-38C 18-09-092-14	12"x12" black floor tile and adhesive (inseparable)	Concession room: flooring center south	Black Homogeneous NOB	27.1	68.3	4.6	0%	100%	NAD inconclusive	Analysis not requested by client
SD-39A.1 18-09-092-15	Braided wire insulation (outer insulation)	Concession room: house wiring inside ceiling j-box	Brown Homogeneous Friable	Not Applicable			90% CELL	10%	NAD	
SD-39A.2 18-09-092-16	Braided wire insulation (inner core)	Concession room: house wiring inside ceiling j-box	Black Homogeneous NOB	49.5	48.6	1.8	0%	100%	NAD inconclusive	NAD
SD-39B.1 18-09-092-17	Braided wire insulation (outer insulation)	Concession room: house wiring inside ceiling j-box	Brown Homogeneous Friable	Not Applicable			90% CELL	10%	NAD	
SD-39B.2 18-09-092-18	Braided wire insulation (inner core)	Concession room: house wiring inside ceiling j-box	Black Homogeneous NOB	49.3	25.5	25.2	0%	100%	NAD inconclusive	NAD
SD-39C.1 18-09-092-19	Braided wire insulation (outer insulation)	Concession room: house wiring inside ceiling j-box	Brown Homogeneous Friable	Not Applicable			90% CELL	10%	NAD	
SD-39C.2 18-09-092-20	Braided wire insulation (inner core)	Concession room: house wiring inside ceiling j-box	Black Homogeneous NOB	48.9	48.5	2.6	0%	100%	NAD inconclusive	Analysis not requested by client
SD-40A 18-09-092-21	Cement board material	Corridor: near attic access hatch	Gray Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-40B 18-09-092-22	Cement board material	Corridor: near attic access hatch	Gray Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-40C 18-09-092-23	Cement board material	Corridor: near attic access hatch	Gray Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-41A.1 18-09-092-24	Joint compound	Woman's restroom: wall joint	White Homogeneous Friable	Not Applicable			0%	100%	NAD	

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CLIENT: Environmental Planning & Management Inc., 1983 Marcus Avenue, Suite 109, Lake Success NY 11042
BUILDING ADDRESS: Metro North RR – **Scarsdale Station** – Scarsdale, Westchester, NY
PROJECT: 18041-03 Station Improvements- (MNR OSS Task # HAL-18-040)

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-41A.2 18-09-092-25	Tape	Woman's restroom: wall joint	Beige Homogeneous Friable	Not Applicable			100% CELL	0%	NAD	
SD-41B.1 18-09-092-26	Joint compound	Concession room wall joint	White Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-41B.2 18-09-092-27	Tape	Concession room wall joint	Beige Homogeneous Friable	Not Applicable			100% CELL	0%	NAD	
SD-41C.1 18-09-092-28	Joint compound	Corridor wall joint	White Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-41C.2 18-09-092-29	Tape	Corridor wall joint	Beige Homogeneous Friable	Not Applicable			100% CELL	0%	NAD	
SD-42A 18-09-092-30	Gypsum board material - white	Concession room wall	White/Brown Homogeneous Friable	Not Applicable			15% CELL 5% FBGL	80%	NAD	
SD-42B 18-09-092-31	Gypsum board material - white	Janitor's closet wall	White/Brown Homogeneous Friable	Not Applicable			15% CELL 7% FBGL	78%	NAD	
SD-42C 18-09-092-32	Gypsum board material - white	Concession room wall	White/Brown Homogeneous Friable	Not Applicable			10% CELL 6% FBGL	84%	NAD	
SD-43A 18-09-092-33	Gypsum board material - gray	Men's room wall	Brown Homogeneous Friable	Not Applicable			10% CELL 3% FBGL	87%	NAD	
SD-43B 18-09-092-34	Gypsum board material - gray	Women's room wall	Brown Homogeneous Friable	Not Applicable			10% CELL 2% FBGL	88%	NAD	
SD-43C 18-09-092-35	Gypsum board material - gray	Men's room wall	Brown Homogeneous Friable	Not Applicable			10% CELL 3% FBGL	87%	NAD	
SD-44A 18-09-092-36	Floor Tile – Mortar	Men's restroom ceramic floor tile	Gray Homogeneous Friable	Not Applicable			0%	100%	NAD	

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PROJECT: 18041-03 Station Improvements- (MNR OSS Task # HAL-18-040)

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-44B 18-09-092-37	Floor Tile – Mortar	Woman's restroom: ceramic floor tile	Gray Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-44C 18-09-092-38	Floor Tile – Mortar	Men's restroom ceramic floor tile	Gray Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-45A 18-09-092-39	Floor Tile - Grout	Men's restroom ceramic floor tile	Dk. Brown Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-45B 18-09-092-40	Floor Tile - Grout	Woman's restroom: ceramic floor tile	Dk. Brown Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-45C 18-09-092-41	Floor Tile - Grout	Men's restroom ceramic floor tile	Dk. Brown Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-46A 18-09-092-42	Wall Tile mortar	Men's restroom 4"x4" ceramic wall tiles	White Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-46B 18-09-092-43	Wall Tile mortar	Men's restroom 4"x4" ceramic wall tiles	White Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-46C 18-09-092-44	Wall Tile mortar	Men's restroom 4"x4" ceramic wall tiles	White Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-47A 18-09-092-45	Wall Tile - Grout	Men's restroom ceramic wall tile	Beige Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-47B 18-09-092-46	Wall Tile - Grout	Woman's restroom: ceramic wall tile	Beige Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-47C 18-09-092-47	Wall Tile - Grout	Men's restroom ceramic wall tile	Beige Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-48A 18-09-092-48	White Caulk	Women's restroom: sink joint	White Homogeneous NOB	63.9	5.4	30.7	0%	100%	NAD inconclusive	Trace CH

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BUILDING ADDRESS: Metro North RR – **Scarsdale Station** – Scarsdale, Westchester, NY
PROJECT: 18041-03 Station Improvements- (MNR OSS Task # HAL-18-040)

Client Sample ID# Lab Sample ID#	Sample Description	Sample Location	Appearance	GRAVIMETRIC PREPARATION			PLM			TEM
				% Ashed Organic Component	% Acid Soluble Inorganic Component	% Acid Insoluble Inorganic Component	% Estimated Non-Asbestos Fibrous Material	% Non-Fibrous Matrix Material	ASBESTOS % & Type	ASBESTOS % & Type
SD-48B 18-09-092-49	White Caulk	Women's restroom: toilet joint	White Homogeneous NOB	63.2	5.2	31.6	0%	100%	NAD inconclusive	Trace CH
SD-48C 18-09-092-50	White Caulk	Men's restroom: Urinal joint	White Homogeneous NOB	64.0	6.4	29.6	0%	100%	NAD inconclusive	Analysis not requested by client
SD-49A 18-09-092-51	Terrazzo flooring material	Common area: terrazzo flooring – east side near door	Gray/White Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-49B 18-09-092-52	Terrazzo flooring material	Common area: terrazzo flooring – east side near door	Gray/White Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-49C 18-09-092-53	Terrazzo flooring material	Common area: terrazzo flooring – west side near phone both	Gray/White Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-50A 18-09-092-54	Grout - gray	Common area: ceramic wall tile joint and backing near phone booth	Gray Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-50B 18-09-092-55	Grout - gray	Common area: ceramic wall tile joint and backing near phone booth	Gray Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-50C 18-09-092-56	Grout - gray	Common area: ceramic wall tile joint and backing near phone booth	Gray Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-51A 18-09-092-57	Grout – dark gray	1" square ceramic floor tile boarder perimeter pattern - entrance	Dk. Brown Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-51B 18-09-092-58	Grout – dark gray	1" square ceramic floor tile boarder perimeter pattern – near booth	Dk. Brown Homogeneous Friable	Not Applicable			0%	100%	NAD	
SD-51C 18-09-092-59	Grout – dark gray	1" square ceramic floor tile boarder perimeter pattern – near corridor	Dk. Brown Homogeneous Friable	Not Applicable			0%	100%	NAD	

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BULK SAMPLE ANALYSIS REPORT

CLIENT: Environmental Planning & Management Inc., 1983 Marcus Avenue, Suite 109, Lake Success NY 11042
BUILDING ADDRESS: Metro North RR – **Scarsdale Station** – Scarsdale, Westchester, NY
PROJECT: 18041-03 Station Improvements- (MNR OSS Task # HAL-18-040)

Date Received: 9/18/18
Date of PLM Analysis: 9/19/18
Date of TEM Analysis: 9/19/18
Date of Report: 9/19/18

PLM Analyst: L. Tchorzewski
TEM Analyst: A. Ansari

Analyst: _____
L. Tchorzewski

QC Review / Date: _____
D. Molohides, Lab Director

NAD= No Asbestos Detected; NA/PS = Not Analyzed / Positive Stop; Trace = < 1%, CH = Chrysotile, AMO = Amosite, CRO = Crocidolite, ANTH = Anthophyllite, TRE = Tremolite, ACT = Actinolite, FBGL = Fiberglass, CELL = Cellulose, SYNTH = Synthetic fibers, VERM = Vermiculite, WOLL = Wollastonite. Polarized Light Microscopy (PLM) analysis of samples is performed by Method EPA 600/M4-82-020 and ELAP PLM Analysis Protocol 198.1 (friable samples) and protocol 198.6 (NOB samples). Transmission Electron Microscopy (TEM) analysis of samples is performed by Method ELAP TEM Analysis Protocol 198.4. This report includes the identification and quantitation of vermiculite as required by current NYS-DOH ELAP protocols & interim guidance letters. Analytical equipments: Stereobinocular microscopes: Professional Bin (PM #1), Accuscope (Ser# 1200608), Carlsan (Ser# 011418); Polarized Light Microscopes: Olympus BH-2 (Ser #: 214335), Olympus BH-2 (Ser #: 236532). PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing. Samples will be stored for sixty (60) days and then returned to the client upon request. The results relate only to the items calibrated or tested. This report may not be reproduced, except in full, without the written approval of Alpha Labs LLC. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the US Government. This report contains data (bulk asbestos TEM results) that are not covered by the NVLAP accreditation. The liability of Alpha Labs LLC with respect to the services charged shall in no event exceed the amount of the invoice. **(November 1, 2016)**

NYS-DOH ELAP # 11833 **NVLAP Lab Code: 200691-0**

Bulk Sample Form

18-09-092

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P. 201.363.1983 | F. 201.363.0800

RESULTS NEEDED: 48 Hour TAT

SEND ALL RESULTS BY EMAIL TO : Mike Aprahamian (maprahamian@epmco.com); Darren Frank (dfrank@epmco.com)

FOLLOW-UP ALL FAXES WITH HARDCOPY BY MAIL TO EPM

SHIPPED BY: Hand Delivered

PROJECT INFORMATION			
CLIENT :	Metro North RR		
EPM # :	18041-03	DATE :	9/17/2018
Project:	Station Improvements - (MNR OSS Task #HAL-18-040)		
Project Location:	Scarsdale Station: Scarsdale, Westchester NY		

LABORATORY NOTE : Analyze by layer via PLM with positive stop.
If negative by PLM and NOB; analyze by TEM only first two (2) samples.

SAMPLE NUMBER		DATE SAMPLED	SAMPLE LOCATION	MATERIAL DESCRIPTION
SD-35A		9/14/2018	Oil room shelter door	Brown paper door insulation
SD-35B			Door between ticket office and boiler room	
SD-35C			Boiler Room door	
SD-36A			Elevator Machine Room backing inside relay cabinet	Black backing board material
SD-36B				
SD-36C				
SD-37A			Attic space, ceiling above corridor	Light gray plaster ceiling
SD-37B			Attic space, ceiling above corridor	
SD-37C			Attic space, ceiling above corridor	
SD-37D			Attic space, above ticket office	
SD-37E			Attic space, above men's room	
SD-38A			Concession room: flooring east side near door	12" x 12" black floor tile and adhesive (inseparable)
SD-38B			Concession room: flooring southeast corner near closet	
SD-38C			Concession room: flooring center south	
SD-39A			Concession room: house wiring inside ceiling j-box	Braided wire insulation
SD-39B				
SD-39C				
SD-40A			Corridor: near attic access hatch	Cement board material
SD-40B				
SD-40C				

Sampler's Relinquishment Signature Date / Time:
9/17/18 3:45 PM

Lab Receipt Signature / Date / Time:
Li Tchernish 9/18/18

BULK SAMPLE FORM

18-09-092 PAGE_2_ OF_3_

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FOLLOW-UP ALL FAXES WITH HARDCOPY BY MAIL TO EPM

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PROJECT INFORMATION			
CLIENT :	Metro North RR		
EPM # :	18041-03	DATE :	9/17/2018
Project:	Station Improvements - (MNR OSS Task #HAL-18-040)		
Project Location:	Scarsdale Station: Scarsdale, Westchester NY		

LABORATORY NOTE : Analyze by layer via PLM with positive stop.
If negative by PLM and NOB, analyze by TEM only first two (2) samples.

SAMPLE NUMBER		DATE SAMPLED	SAMPLE LOCATION	MATERIAL DESCRIPTION
SD-41A			Woman's restroom: wall joint	Joint compound/tape
SD-41B			Concession room wall joint	
SD-41C			Corridor wall joint	
SD-42A			Concession room wall	Gypsum board material - white
SD-42B			Janitor's closet wall	
SD-42C			Concession room wall	
SD-43A			Men's room wall	Gypsum beard material - gray
SD-43B			Women's room wall	
SD-43C			Men's room wall	
SD-44A			Men's restroom ceramic floor tile	Floor tile - Mortar
SD-44B			Woman's restroom: ceramic floor tile	
SD-44C			Men's restroom ceramic floor tile	
SD-45A			Men's restroom ceramic floor tile	Floor tile - Grout
SD-45B		9/14/2018	Woman's restroom: ceramic floor tile	
SD-45C			Men's restroom ceramic floor tile	
SD-46A			Men's restroom 4" x 4" ceramic wall tiles	Wall Tile mortar
SD-46B				
SD-46C				
SD-47A			Men's restroom ceramic wall tile	Wall tile Grout
SD-47B			Woman's restroom: ceramic wall tile	
SD-47C			Men's restroom ceramic wall tile	

Sampler's Relinquishment Signature / Date / Time: 9/17/18 3:45PM

Lab Receipt Signature / Date / Time: 9/18/18

BULK SAMPLE FORM 18-09-092 PAGE_3_ OF_3_

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PROJECT INFORMATION			
CLIENT :	Metro North RR		
EPM # :	18041-03	DATE :	9/17/2018
Project:	Station Improvements - (MNR OSS Task #HAL-18-040)		
Project Location:	Scarsdale Station: Scarsdale, Westchester NY		

LABORATORY NOTE : Analyze by layer via PLM with positive stop.
If negative by PLM and NOB, analyze by TEM only first two (2) samples.

SAMPLE NUMBER	DATE SAMPLED	SAMPLE LOCATION	MATERIAL DESCRIPTION
SD-48A		Women's restroom: sink joint	White caulk
SD-48B		Women's restroom: toilet joint	
SD-48C		Men's restroom: Urinal joint	
SD-49A	9/14/2018	Common area: terrazzo flooring - east side near door	Terrazzo flooring material
SD-49B		Common area: terrazzo flooring - east side near door	
SD-49C		Common area: terrazzo flooring - westside near phone booth	
SD-50A		Common area: ceramic wall tile joint and backing near phone booth	Grout - gray
SD-50B			
SD-50C			
SD-51A		1" square ceramic floor tile boarder perimeter pattern - entrance	Grout - dark gray
SD-51B		1" square ceramic floor tile boarder perimeter pattern - near booth	
SD-51C		1" square ceramic floor tile boarder perimeter pattern - near corridor	

Sampler's Relinquishment Signature / Date / Time: 9/17/18 3:45 PM

Lab Receipt Signature / Date / Time: 9/18/18

APPENDIX F
XRF Performance Characteristic Sheet

Performance Characteristic Sheet

EFFECTIVE DATE: **September 24, 2004** **EDITION NO.: 1**

MANUFACTURER AND MODEL:

Make: *Niton LLC*
Tested Model: *XLp 300*
Source: ^{109}Cd
Note: This PCS is also applicable to the equivalent model variations indicated below, for the Lead-in-Paint K+L variable reading time mode, in the XLi and XLp series:

XLi 300A, XLi 301A, XLi 302A and XLi 303A.
XLp 300A, XLp 301A, XLp 302A and XLp 303A.
XLi 700A, XLi 701A, XLi 702A and XLi 703A.
XLp 700A, XLp 701A, XLp 702A, and XLp 703A.

Note: The XLi and XLp versions refer to the shape of the handle part of the instrument. The differences in the model numbers reflect other modes available, in addition to Lead-in-Paint modes. The manufacturer states that specifications for these instruments are identical for the source, detector, and detector electronics relative to the Lead-in-Paint mode.

FIELD OPERATION GUIDANCE

OPERATING PARAMETERS:

Lead-in-Paint K+L variable reading time mode.

XRF CALIBRATION CHECK LIMITS:

0.8 to 1.2 mg/cm^2 (inclusive)

The calibration of the XRF instrument should be checked using the paint film nearest 1.0 mg/cm^2 in the NIST Standard Reference Material (SRM) used (e.g., for NIST SRM 2579, use the 1.02 mg/cm^2 film).

If readings are outside the acceptable calibration check range, follow the manufacturer's instructions to bring the instruments into control before XRF testing proceeds.

SUBSTRATE CORRECTION:

For XRF results using Lead-in-Paint K+L variable reading time mode, substrate correction is <u>not</u> needed for:

Brick, Concrete, Drywall, Metal, Plaster, and Wood

INCONCLUSIVE RANGE OR THRESHOLD:

K+L MODE READING DESCRIPTION	SUBSTRATE	THRESHOLD (mg/cm^2)
Results not corrected for substrate bias on any substrate	Brick	1.0
	Concrete	1.0
	Drywall	1.0
	Metal	1.0
	Plaster	1.0
	Wood	1.0

BACKGROUND INFORMATION

EVALUATION DATA SOURCE AND DATE:

This sheet is supplemental information to be used in conjunction with Chapter 7 of the HUD *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing* ("HUD Guidelines"). Performance parameters shown on this sheet are calculated from the EPA/HUD evaluation using archived building components. Testing was conducted in August 2004 on 133 testing combinations. The instruments that were used to perform the testing had new sources; one instrument's was installed in November 2003 with 40 mCi initial strength, and the other's was installed June 2004 with 40 mCi initial strength.

OPERATING PARAMETERS:

Performance parameters shown in this sheet are applicable only when properly operating the instrument using the manufacturer's instructions and procedures described in Chapter 7 of the HUD Guidelines.

SUBSTRATE CORRECTION VALUE COMPUTATION:

Substrate correction is not needed for brick, concrete, drywall, metal, plaster or wood when using Lead-in-Paint K+L variable reading time mode, the normal operating mode for these instruments. If substrate correction is desired, refer to Chapter 7 of the HUD Guidelines for guidance on correcting XRF results for substrate bias.

EVALUATING THE QUALITY OF XRF TESTING:

Randomly select ten testing combinations for retesting from each house or from two randomly selected units in multifamily housing. Use the K+L variable time mode readings.

Conduct XRF retesting at the ten testing combinations selected for retesting.

Determine if the XRF testing in the units or house passed or failed the test by applying the steps below.

Compute the Retest Tolerance Limit by the following steps:

Determine XRF results for the original and retest XRF readings. Do not correct the original or retest results for substrate bias. In single-family housing a result is defined as the average of three readings. In multifamily housing, a result is a single reading. Therefore, there will be ten original and ten retest XRF results for each house or for the two selected units.

Calculate the average of the original XRF result and retest XRF result for each testing combination.

Square the average for each testing combination.

Add the ten squared averages together. Call this quantity C.

Multiply the number C by 0.0072. Call this quantity D.

Add the number 0.032 to D. Call this quantity E.

Take the square root of E. Call this quantity F.

Multiply F by 1.645. The result is the Retest Tolerance Limit.

Compute the average of all ten original XRF results.

Compute the average of all ten re-test XRF results.

Find the absolute difference of the two averages.

If the difference is less than the Retest Tolerance Limit, the inspection has passed the retest. If the difference of the overall averages equals or exceeds the Retest Tolerance Limit, this procedure should be repeated with ten new testing combinations. If the difference of the overall averages is equal to or greater than the Retest Tolerance Limit a second time, then the inspection should be considered deficient.

Use of this procedure is estimated to produce a spurious result approximately 1% of the time. That is, results of this procedure will call for further examination when no examination is warranted in approximately 1 out of 100 dwelling units tested.

TESTING TIMES:

For the Lead-in-Paint K+L variable reading time mode, the instrument continues to read until it is moved away from the testing surface, terminated by the user, or the instrument software indicates the reading is complete. The following table provides testing time information for this testing mode. The times have been adjusted for source decay, normalized to the initial source strengths as noted above. Source strength and type of substrate will affect actual testing times. At the time of testing, the instruments had source strengths of 26.6 and 36.6 mCi.

Testing Times Using K+L Reading Mode (Seconds)						
	All Data			Median for laboratory-measured lead levels (mg/cm^2)		
Substrate	25^{th} Percentile	Median	75^{th} Percentile	Pb < 0.25	0.25 ≤ Pb<1.0	1.0 ≤ Pb
Wood Drywall	4	11	19	11	15	11
Metal	4	12	18	9	12	14
Brick Concrete Plaster	8	16	22	15	18	16

CLASSIFICATION RESULTS:

XRF results are classified as positive if they are greater than or equal to the threshold, and negative if they are less than the threshold.

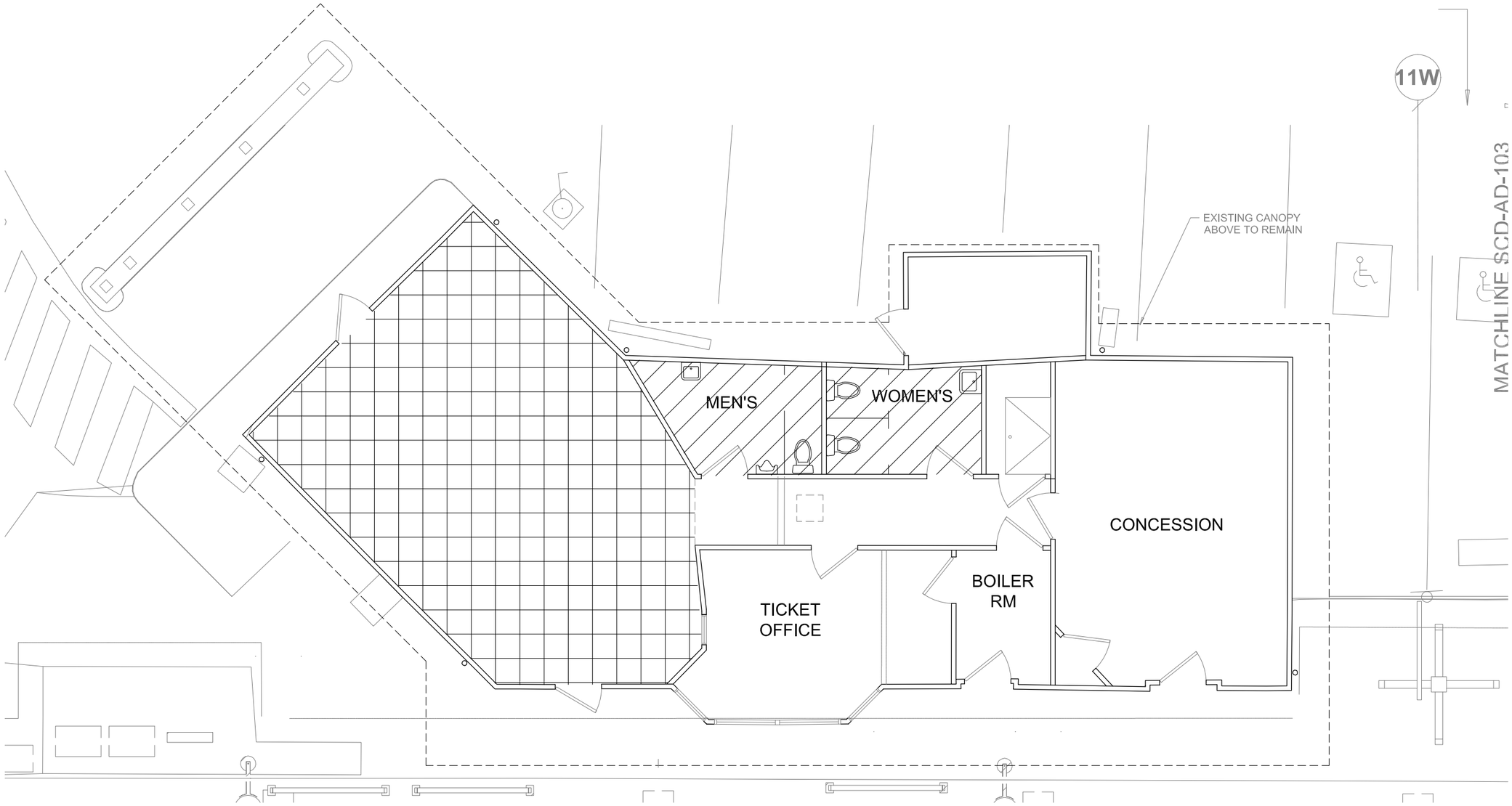
DOCUMENTATION:

A document titled *Methodology for XRF Performance Characteristic Sheets* provides an explanation of the statistical methodology used to construct the data in the sheets, and provides empirical results from using the recommended inconclusive ranges or thresholds for specific XRF instruments. For a copy of this document call the National Lead Information Center Clearinghouse at 1-800-424-LEAD.

This XRF Performance Characteristic Sheet was developed by the Midwest Research Institute (MRI) and QuanTech, Inc., under a contract between MRI and the XRF manufacturer. HUD has determined that the information provided here is acceptable when used as guidance in conjunction with Chapter 7, Lead-Based Paint Inspection, of HUD's *Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing*.

APPENDIX G

Presumed Asbestos Material Location Schematics



LEGEND:

LOCATION OF PRESUMED ACM UNDERLAYMENT BENEATH TERRAZZO FLOORING AND CONCRETE BED

LOCATION OF PRESUMED ACM WATERPROOFING BENEATH CERAMIC FLOOR TILES AND CONCRETE BED

N

EPM
Environmental Planning & Management, Inc.
www.epmco.com

DRAWN BY:	MH/AR	DATE:	
CHECKED BY:	MA	FILENAME:	SCARSDALE STA
APPR'VD BY:	SG	SCALE:	NOT TO SCALE

PATH: X:\Metro North RR\18041–Term\Task 3 OSS# HAL –18–040–AL

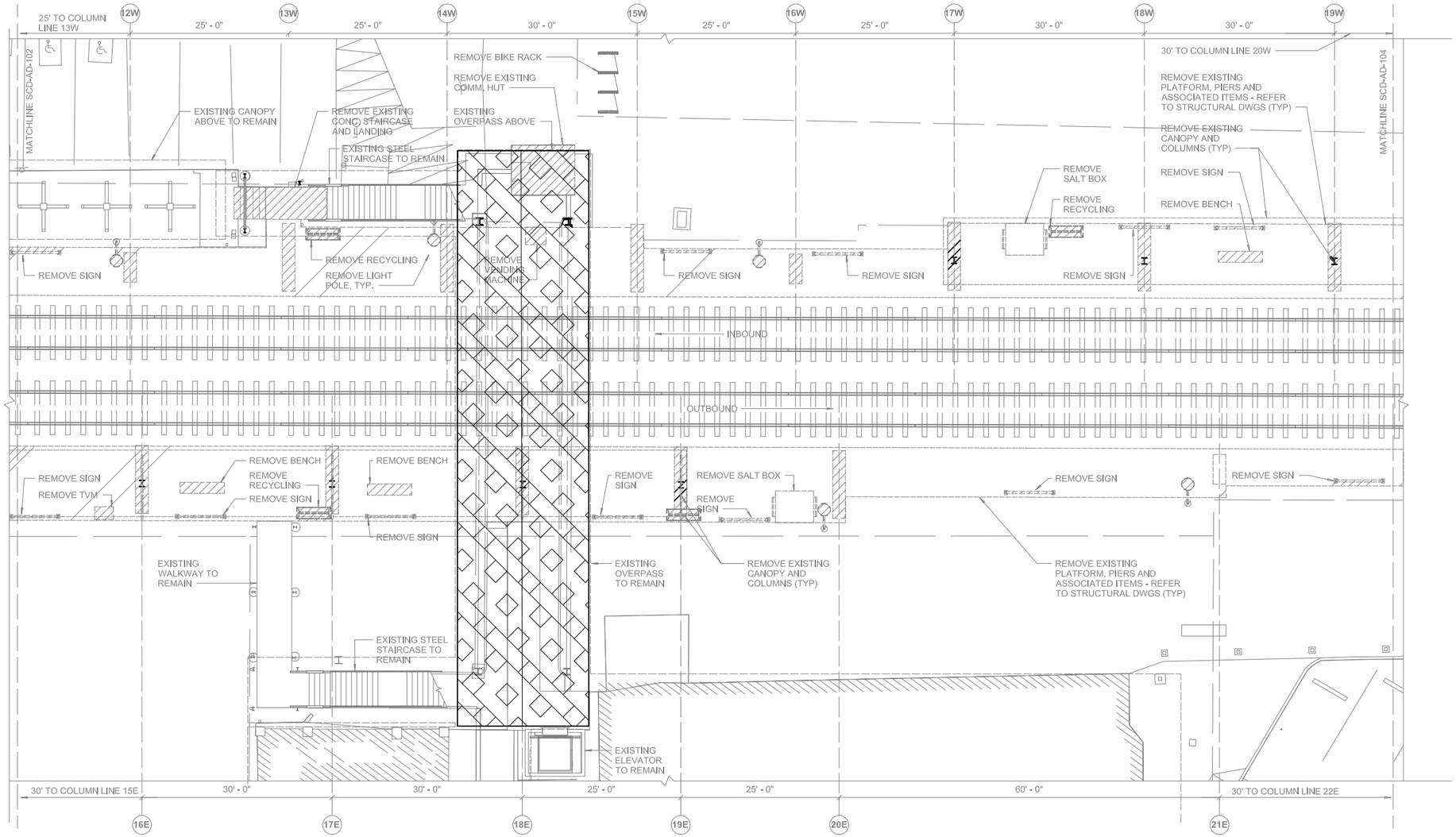
CLIENT: Metro-North Railroad
Office of System Safety
420 Lexington Ave. Suite 930
New York, NY 10170

PROJECT NAME:
DESIGN BUILD SERVICES FOR SCARSDALE AND HARTSDALE STATION IMPROVEMENTS

DRAWING NAME: GROUND FLOOR - BLDG ADJACENT TO STATION

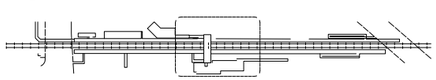
PROJECT TITLE: SCARSDALE STATION, WESTCHESTER, NY
ASBESTOS MATERIAL LOCATION SCHEMATIC

FIGURE NO: **ACM-01**
SHEET # 1 OF 2



STATION PLAN

NOT TO SCALE



LEGEND

TO BE REMOVED

LEGEND:

PRESUMED ASBESTOS CONTAINING ROOFING MATERIAL/ TAR PAPER BENEATH TERRA–COTTA ROOF TILES ON PEDESTRIAN OVERPASS

EPM Environmental Planning & Management, Inc. www.epmco.com	DRAWN BY: MH/AR	DATE: JUNE 2019	CLIENT: MTA Metro-North Railroad, Office of System Safety, 420 Lexington Ave. Suite 930, New York, NY 10170
	CHECKED BY: MA	FILENAME: SCARSDALE STA	PROJECT NAME: DESIGN BUILD SERVICES FOR SCARSDALE AND HARTSDALE STATION IMPROVEMENTS
	APPR'VD BY: SG	SCALE: NOT TO SCALE	DRAWING NAME: STATION PLAN AT PEDESTRIAN OVERPASS
	PATH: X:\Metro North RR\18041–Term\Task 3 OSS# HAL –18–040–AL		PROJECT TITLE: SCARSDALE STATION, WESTCHESTER, NY ASBESTOS MATERIAL LOCATION SCHEMATIC

FIGURE NO: **ACM-02**

SHEET # 2 OF 2

Metro-North Railroad Capital Project Guideline (CPG)	SECTION F DESIGN MANAGEMENT	F.8 Version 003
	SUSTAINABLE INFRASTRUCTURE DESIGN	Effectivity Date Jan/1/2018

APPROVED BY

NAME	TITLE	SIGNATURE	DATE
B. Vero	Director Project Controls and Quality Assurance	Bernadette Vero	8/31/17
M. Miceli	Director - Shops, Yards, Environmental and Special Projects	Mar Miceli	9/28/17
K. Timko	Director Environmental Compliance & Service	Ken Timko	9/7/17
R. Culhane	Director, Operating Capital Projects, Budget and Controls	R Culhane	8/31/17

Version History

Version	Effectivity Date	Description	Author
New	Oct/08/1992	Creation of CPMP 50-101 to 50-703 (original procedures which does not include sustainability)	R. Feretti, AD QA N. Marcelo, Manager QA
New	Aug/19/2002	CPG-H.50 "MNR Sustainable Design/ Design for the Environment Generic Recommendations and Guidelines" created.	R. W. Walker, Director-Operating Capital Projects
001	Apr/10/2007	CPMP 50-101 to 50-703 renamed as CPP and CPG and reformatted. CPG-F.8 "Sustainability Design/ Design for the Environment" created and included into section CPG-F as one document.	R. Feretti, AD QA
002	May/30/2007	CPG-F.8 "Sustainability Design/ Design for the Environment" Changes to section CPG-F (one document) were made, with no changes to CPG-F.8.	R. Feretti, AD QA
003	Jan/01/2018	The contents of CPG-H.50 has been incorporated into CPG-F.8. CPG.H.50 obsoleted. CPG-F.8 renamed as "Sustainable Infrastructure Design" Update to include E088, ISO50001, and other Sustainable Design Requirements/ Recommendations, as well as Energy Management Requirements/ Recommendations.	D. Coyle, Manager Operating Capital-Energy Group R. Bottali, Assistant Director-Sustainability & Environment O. Leung, Manager QA

Capital Program Quality Assurance is responsible for maintaining this document. All suggestions for change should be sent to the Project Controls and Quality Assurance Department.

Departments that participated in the preparation of this version:
Operations Energy Group
Capital Programs Sustainability Group
General Counsel Environmental Compliance and Services Group
Project Controls and Quality Assurance

Metro-North Railroad

Guideline CPG-F.8:

Sustainable Infrastructure Design

Generic Recommendations and Guideline

Capital Programs
Operating Capital Projects

Issued August 19, 2002
Revised September 28, 2017

Contents

Mission Statement

Governor Cuomo signed Executive Order 88 on December 28, 2012, directing State Entities to reduce Energy Use Intensity in state owned and managed buildings by at least 20% by 2020. Among other required actions, such as benchmarking and sub-metering, EO 88 also requires the incorporation of energy efficiency analyses in the Capital Planning Process.
These guidelines establish a framework for the implementation of holistic, sustainable design recommendations into all projects for the creation of sustainable and efficient buildings, facilities and other capital projects at MTA Metro-North Railroad that can improve resilience, lower long-term operational and maintenance costs, reduce energy consumption and reduce negative impacts to the community, the environment, and Railroad employees.

It is intended that these recommendations be viewed as part of a full life cycle cost analysis for Capital Projects. These recommendations should be pursued and implemented, where practicable, economically-feasible and within budget constraints by all of the Railroad's project managers, designers and third party design consultants in the design of Capital Projects, with full consideration of the long-term life cycle implications of all project design elements.

Energy conservation, energy efficiency, indoor environmental quality, resource conservation, significant waste reduction, responsible waste management, maximization of recycling , and water conservation, are the basis and impetus for the development of recommendations aimed at promoting pollution prevention and conservation of natural resources. These guidelines are intended to be appreciably ahead of current standards and practices for capital construction projects, and the products of this effort will become the models for a healthier, ecologically-responsible environment where occupants collectively enjoy the benefits of working and living in a "green" environment.

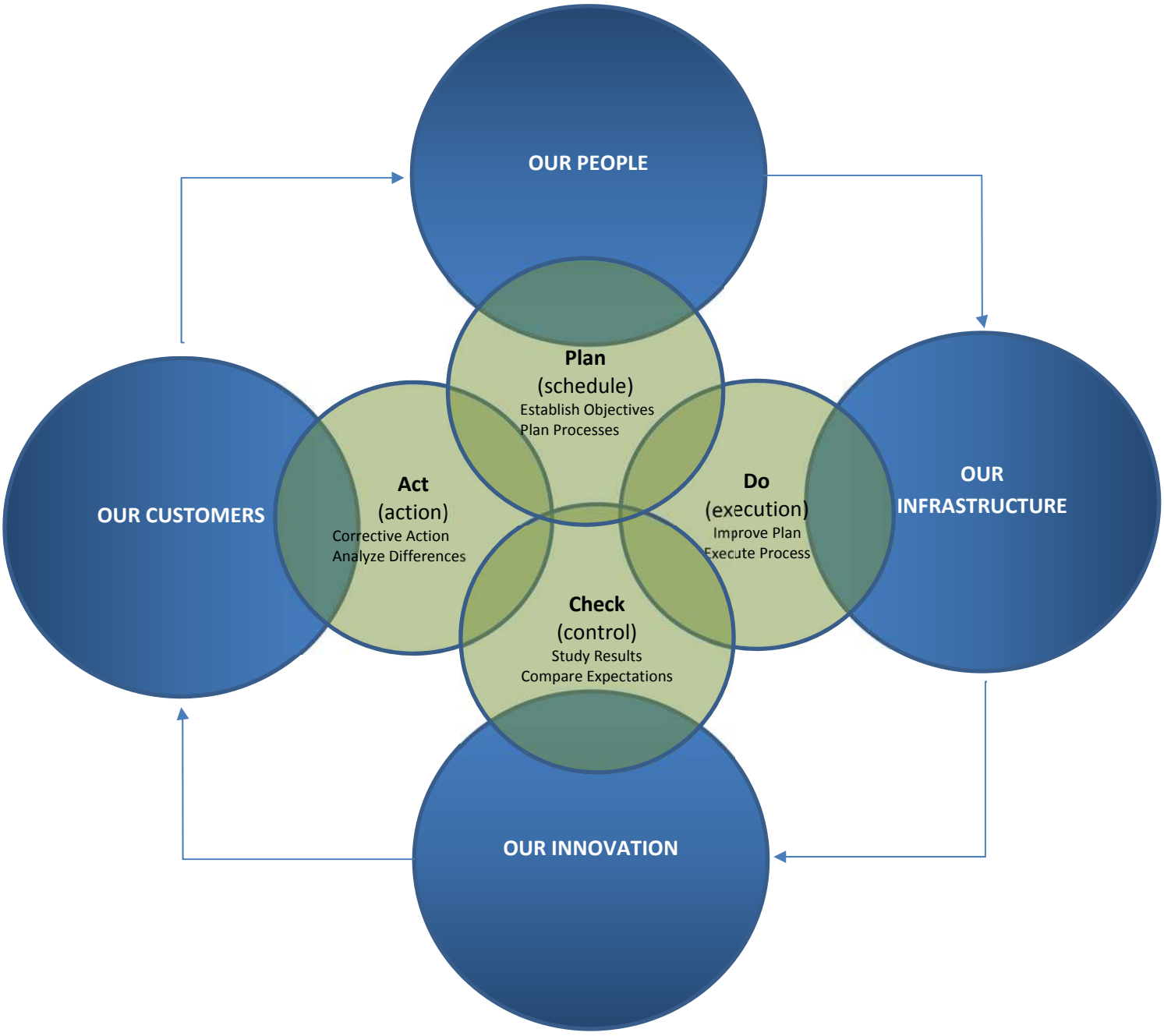
Each section now contains reference to related Envision® credits. Envision® is a rating system for sustainable infrastructure, and is the product of a joint collaboration between the Zofnass Program for Sustainable Infrastructure at the Harvard University Graduate School of Design and the Institute for Sustainable Infrastructure. It is a planning and design guidance tool, not a set of prescriptive measures. These Sustainable Infrastructure Design guidelines incorporate the framework and elements of Envision® that are most relevant to Metro-North. In addition, to coordinate with ISO 50001 efforts and our Strategic Energy Management Plan, relevant sections contain references to related ISO 50001:2011(E) clauses.

The system is a collection of tools and credits covering all phases of a project's life cycle: planning, design, construction, operation and deconstruction. As such, it is recommended that project teams review the full Envision® guidance manual early in project planning.

Metro-North Capital Guideline
Guideline CPG-F.8: Sustainable Infrastructure Design Version 003

OUR RAILROAD, OUR VISION, OUR FUTURE:

Our Strategic Plan for 2016-2020



Metro-North Capital Guideline

Guideline CPG-F.8: Sustainable Infrastructure Design Version 003

ENVISION Credit List

QUALITY OF LIFE
13 Credits

1 PURPOSE

QL1.1 Improve Community Quality of Life
QL1.2 Stimulate Sustainable Growth & Development
QL1.3 Develop Local Skills and Capabilities

2 WELLBEING

QL2.1 Enhance Public Health and Safety
QL2.2 Minimize Noise and Vibration
QL2.3 Minimize Light Pollution
QL2.4 Improve Community Mobility and Access
QL2.5 Encourage Alternative Modes of Transportation
QL2.6 Improve Site Accessibility, Safety & Wayfinding

3 COMMUNITY

QL3.1 Preserve Historic and Cultural Resources
QL3.2 Preserve Views and Local Character
QL3.3 Enhance Public Space

QL0.0 Innovate or Exceed Credit Requirements

LEADERSHIP
10 Credits

1 COLLABORATION

LD1.1 Provide Effective Leadership & Commitment
LD1.2 Establish a Sustainability Management System
LD1.3 Foster Collaboration and Teamwork
LD1.4 Provide for Stakeholder Involvement

2 MANAGEMENT

LD2.1 Pursue By-Product Synergy Opportunities
LD2.2 Improve Infrastructure Integration

3 PLANNING

LD3.1 Plan for Long-Term Monitoring & Maintenance
LD3.2 Address Conflicting Regulations and Policies
LD3.3 Extend Useful Life

LD0.0 Innovate or Exceed Credit Requirements

RESOURCE ALLOCATION
14 Credits

1 MATERIALS

RA1.1 Reduce Net Embodied Energy
RA1.2 Support Sustainable Procurement Practices
RA1.3 Use Recycled Materials
RA1.4 Use Regional Materials
RA1.5 Divert Waste from Landfills
RA1.6 Reduce Excavated Materials Taken Off Site
RA1.7 Provide for Deconstruction and Recycling

2 ENERGY

RA2.1 Reduce Energy Consumption
RA2.2 Use Renewable Energy
RA2.3 Commission and Monitor Energy Systems

3 WATER

RA3.1 Protect Fresh Water Availability
RA3.2 Reduce Potable Water Consumption
RA3.3 Monitor Water Systems

RA0.0 Innovate or Exceed Credit Requirements

NATURAL WORLD
15 Credits

1 SITING

NW1.1 Preserve Prime Habitat
NW1.2 Protect Wetlands and Surface Water
NW1.3 Preserve Prime Farmland
NW1.4 Avoid Adverse Geology
NW1.5 Preserve Floodplain Functions
NW1.6 Avoid Unsuitable Development on Steep Slopes
NW1.7 Preserve Greenfields

2 LAND+WATER

NW2.1 Manage Stormwater
NW2.2 Reduce Pesticides and Fertilizer Impacts
NW2.3 Prevent Surface and Groundwater Contamination

3 BIODIVERSITY

NW3.1 Preserve Species Biodiversity
NW3.2 Control Invasive Species
NW3.3 Restore Disturbed Soils
NW3.4 Maintain Wetland and Surface Water Functions

NW0.0 Innovate or Exceed Credit Requirements

CLIMATE AND RISK
8 Credits

1 EMISSIONS

CR1.1 Reduce Greenhouse Gas Emissions
CR1.2 Reduce Air Pollutant Emissions

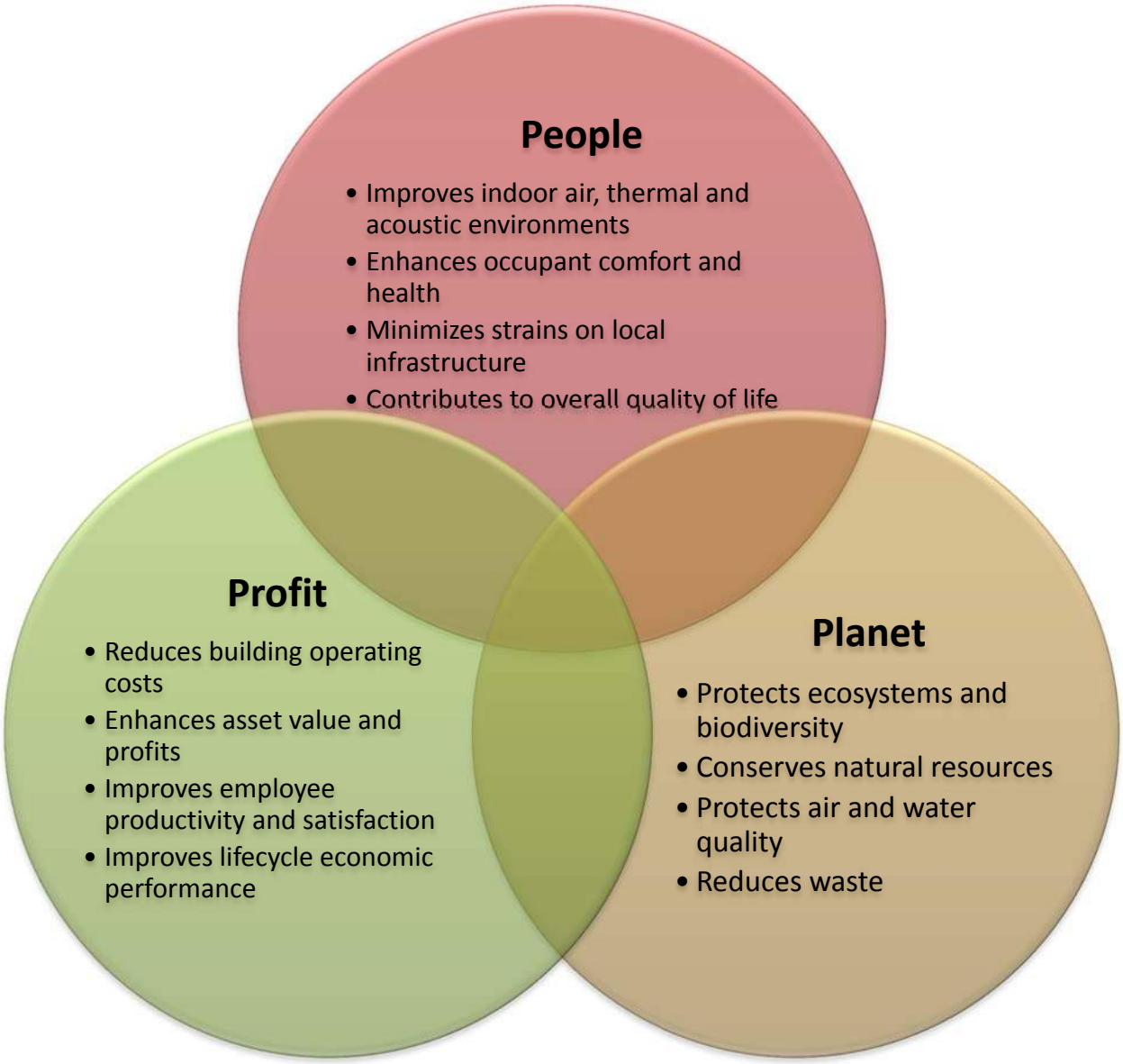
2 RESILIENCE

CR2.1 Assess Climate Threat
CR2.2 Avoid Traps and Vulnerabilities
CR2.3 Prepare for Long-Term Adaptability
CR2.4 Prepare for Short-Term Hazards
CR2.5 Manage Heat Island Effects

CR0.0 Innovate or Exceed Credit Requirements

Institute for Sustainable Infrastructure. *ENVISION Rating System for Sustainable Infrastructure (EVISION®).* 2015.

Triple Bottom Line - Sustainability



1.0 Energy Efficiency

Metro-North is an ISO 50001-compliant organization. Our implementation of ISO 50001 Energy Management System supports an ongoing endeavor to:

- Aspire to provide the resources and information required to drive toward our energy targets and sustain our accomplishments;
- Drive energy performance improvement in design activities;
- Comply with all applicable energy laws and regulations;
- Fulfill energy performance improvements by establishing practical energy objectives and targets supported by procedures and programs to be reviewed on a regular basis using a simple Plan-Do-Check-Act methodology;
- Procure energy efficient products and services where feasible and practical, while ensuring that our commitments to safety, our customers and the environment are not compromised;
- Implement training and capability building in the areas necessary;
- Cultivate a culture of continuous improvement by regularly reviewing our efforts, benchmarking our progress and celebrating successes;
- Share our expertise within the MTA family of agencies, various public transportation groups, forums and other industry outlets;
- Share our experience and expertise within the MTA and City agencies, various public transportation groups and forums and other energy outlets.

Suppliers should understand that procurements are partly evaluated on the basis of energy performance. In compliance with Metro-North Railroad's ISO 50001 Strategic Energy Management Plan (SEMP), when designing facilities that will consume energy, Designers shall provide an evaluation of the energy consuming equipment. This evaluation shall include the benefits of each, the deficits of each, maintenance intensity, a life cycle cost analysis, and a recommendation for inclusion in the design, or not, along with rationale to support the recommendation.

1.1 Maximize Energy Efficiency

Intent:
Consistent with ISO 50001:2011(E), section 4.4.6 Energy objectives, energy targets and energy management action plans, section 4.5.6 Design, and section 4.6.2 Evaluation of compliance with legal requirements and other requirements - Conserve energy through a reduction in operating and maintenance energy consumption. Improve energy performance, reduce operating costs, reduce the environmental impact associated with energy consumption, and improve the overall quality of the indoor workplace environment.

Metro-North Capital Guideline

Guideline CPG-F.8: Sustainable Infrastructure Design Version 003

Requirement:

1. Consider energy performance improvement opportunities and operational control in the design of new, modified and renovated facilities, equipment, systems and processes that can have a significant impact on its energy performance.
2. For new construction, meet the requirements of the NY State Energy Code in effect at the time of project design, or the proposed changes to the Energy Code.
3. For new buildings or existing buildings undergoing renovation, perform a lifecycle cost analysis (LCA) on energy consuming systems and components with the goal of meeting a 20% reduction in Energy Use Intensity (EUI), per Executive Order 88.
4. Use highly efficient means of providing heating and cooling. Heating, ventilation and air conditioning (HVAC) systems shall be of the highest efficiency available during the design. Refer to Section 2.1
5. When installing new lighting fixtures, or replacing existing light fixtures, use solid state Light Emitting Diode (LED) luminaires for all interior and exterior lighting.

Recommendations:

1. Provide lighting control systems that reduce energy consumption while also maintaining safety and security. Incorporate photo cells, calendar day timers, occupancy sensors, daylight harvesting, dimming, and control interfaces that allow controllability and monitoring of lighting performance.
2. Use high efficiency windows and doors. The minimum standard for all windows and exterior glazing will be double-glazed units with Low-E glass (.33 R-value center of glass) in windows with thermal breaks and insulated spacers.
3. Use EnergyStar appliances and fixtures when available.
4. Incorporate daylighting to minimize the need for artificial illumination during the day. This may include: energy efficient windows, clerestories, skylights, light tubes, translucent panels.
5. Incorporate natural ventilation techniques to minimize the need for mechanical ventilation.
6. Incorporate air-to-air heat exchangers and heat recovery equipment wherever feasible
7. Incorporate building materials that offer longer service lives over materials that are initially less costly but have shorter service lives.
8. Incorporate into the design the use of low-embodied energy materials.
9. Design the building envelope around high efficiency wall and roof assemblies that offer R-values and U-values exceeding the current energy code.
10. Incorporate continuous thermal breaks in wall and roof assemblies.
11. Incorporate into the design of the exterior envelope materials that will greatly reduce heat loss in winter and heat gain in summer.
12. Utilize high efficiency motors (i.e. NEMA Premium, permanent magnet) where practicable.
13. Design HVAC systems around demand controlled ventilation.
14. Specify variable frequency drives (VFD) for all fans, pumps and motors.
15. Investigate the incorporation of solar photovoltaics into the construction.
16. Consider incorporation of passive solar systems for the provision of “free heating” (i.e. SolarWall).
17. Investigate the use of geothermal energy for heating and cooling.
18. Consider green roofs that reduce building heating and cooling loads while minimizing rainwater runoff and siltation of water bodies.
19. Consider the use of HVLS fans in buildings.

Technologies/Strategies:

- Use high performance glazing, dynamic glazing, and other measures to maximize shading coefficients and insulating qualities.
- Specify triple glazed windows.

- Optimize insulation of exterior wall and roof construction techniques to limit infiltration.
- Use thermal breaks at windows.
- Use window treatments (i.e., solar shades, curtains, etc.) to minimize heat gain.
- Explore heat recovery from exhaust air systems.
- Explore exterior wall technology such as solar walls.
- Investigate the most energy efficient heating, cooling and ventilating systems, including geothermal, where feasible.

Related Envision Credits:
RA1.1 Reduce Net Embodied Energy

1.2 Modeling for Energy Performance

Intent:
Consistent with ISO 50001:2011(E), section 4.4.6 Energy objectives, energy targets and energy management action plans, section 4.5.6 Design, and 4.6.1 Monitoring, measuring and analysis - In accordance with the building code, use computer models to prepare an energy model of the building or facility. An energy model serves as an important interactive design tool to forecast building energy usage and performance. Energy modeling will reduce operating costs and the environmental impacts associated with energy consumption, while improving occupant comfort and health, and help "right size" mechanical systems for buildings and facilities.

Requirement:

1. As part of the capital planning process, all Affected State Entities shall include an energy efficiency analysis in the design phase of all capital project plans. The capital project should include energy efficient measures or technologies determined to be the most cost-effective, as defined by the BuildSmart New York Guidelines.
2. The Design Consultant shall provide an initial energy model and revise it, adding new data as the design progresses, in order to evaluate the energy efficiency of the building.

Recommendations:
Use energy models such as DOE-2, eQuest or similar

Technologies/Strategies:
Utilize computer modeling to facilitate an interactive process by which the owner, architect, engineer, and construction team can adequately explore opportunities for energy conservation.

Related Envision Credits:
RA2.1 Reduce Energy Consumption

1.3 Renewable Energy

Intent:
Consistent with ISO 50001:2011(E), section 4.4.6 Energy objectives, energy targets and energy management action plans, section 4.5.6 Design, and 4.6.1 Monitoring, measuring and analysis - Evaluate the feasibility, and employ the use of renewable energy technologies to reduce pollutants in the atmosphere, reduce operating costs, reduce the environmental impact associated with energy consumption, and improve resiliency.

Requirement:

1. Evaluate the feasibility of renewable energy, including nontraditional energy sources, to effectively increase the portion of operational energy that comes from renewable energy resources.

Recommendations:

1. Incorporate Photovoltaic (PV) systems (i.e. roof or ground mounted). Incorporate Building Integrated Photovoltaic (BIPV) systems (i.e. building facades, canopies) PV installations shall be metered and monitored to ensure optimal performance. Ongoing maintenance of PV systems must be addressed during design stage.
2. Incorporate solar thermal technology for generating domestic hot water or hot water for hydronic heating systems
3. Incorporate geothermal heating and cooling systems.
4. Incorporate small-scale wind technology
5. Specify adaptable equipment that can accept multiple fuel sources (i.e. Bio fuels versus Natural Gas).

Technologies/Strategies:

- Incorporate solar PV canopies at stations facilities.
- Incorporate solar PV arrays on roofs of buildings and facilities.
- Investigate energy storage technologies for traction power and for facility energy savings.

Related Envision Credits:
RA2.1 Reduce Energy Consumption
RA2.2 Use Renewable Energy

2.0 Enhanced Indoor Environment Quality (IEQ)

2.1 Indoor Air Quality (IAQ)

Intent:
Employ architectural and HVAC design strategies to enhance the IAQ to positively impact the overall indoor environment, health, and well-being of the occupants.

Requirement:

1. Design HVAC systems in accordance with the latest energy code and ASHRAE standards and recommended practices
2. Ensure ventilation is capable of providing the proper air exchange rates for industrial process (i.e. shop) areas and meets current codes
3. Provide systems equipped with Demand Controlled Ventilation (DCV).
4. Ensure interior environments are positively pressurized in relation to the outdoors (i.e. more air is being supplied into the building than is being exhausted out of the building)
5. Incorporate Building Management Systems (BMS) that allow building management the ability to monitor and manage the operation of energy consuming equipment (i.e. HVAC, lighting, industrial process loads, pumps)
6. HVAC systems shall be capable of providing outdoor air. The quantity of outdoor air to be delivered shall be controlled via a demand controlled system controlling the modulation of the outdoor air and return air dampers.
7. HVAC systems shall be equipped with high efficiency air filtration systems that are capable of removing particulates from the return and outdoor air.
8. Maintenance facilities shall be provided with dedicated heating and ventilation systems that deliver 100% outdoor air and are equipped with heat recovery. Provide dedicated ventilation systems of 100% outside air with heat recovery systems for maintenance areas associated with chemical use, paint storage, lubricants or other potentially harmful pollutants.
9. Provide mechanical exhaust for all maintenance facilities (i.e. shops), bathrooms, toilets, locker rooms, shower facilities, pantry/kitchen areas, rooms/closets used for chemical storage or where chemical products are used, paint storage, lubricant storage, janitorial closets, and other locations where the general use of the space or where products in use may result in occupant discomfort
10. Provide local exhaust ventilation for processes (i.e. welding, brazing, wheel lathing, solvent parts cleaning, chemical processes) that may generate airborne contaminants
11. Provide full sheet metal linings for all exhaust systems.
12. Provide walk-off grilles at all building entrances to catch potential contaminants and dirt and decrease maintenance requirements.

Recommendations:

1. Be mindful of placement of HVAC intakes adjacent to pollutant sources (i.e. chimneys, loading docks, bathroom exhausts, waste line vent stacks, industrial process exhausts).
2. The Mechanical Engineer of record should investigate the filtration options available by the equipment manufacturer and recommend a level of filtration that is commensurate with the space occupancy and in accordance with ASHRAE recommendations.
3. The Carbon Dioxide (CO_2) exhaled by building occupants is used as a tracer gas to determine ventilation requirements (i.e. Demand Controlled Ventilation). Room thermostats are equipped with CO_2 sensors. As CO_2 concentrations increase and reach prescribed limits, additional outdoor air is delivered to the space.

Technologies/Strategies:

- Provide a thermally comfortable environment that is responsive to the local climate conditions to reduce health related issues for occupants.
- Design should account for the projections for future climate conditions in Section 6 based on expected life of the facility
- Locate building outdoor air intakes away from loading areas, building exhaust fans, cooling towers, and other sources of contamination.
- See section 2.2 for Low Emitting Materials

Related Envision Credits:
QL2.1 Enhance Public Health and Safety
CR1.2 Reduce Air pollutant Emissions

2.2 Select Low Emitting Materials

Intent:
Specify materials that contain no known carcinogens, have low levels of Volatile Organic Compounds (VOC's), and are non-toxic and chemically inert to reduce the amount of indoor chemical contaminants that can adversely affect air quality, human health, and the environment.

Requirement:

1. At a minimum, comply with NYSDEC Part 228: Surface Coating Processes, Commercial and Industrial Adhesives, Sealants and Primers.
2. All products in interior occupied areas must be GREENGUARD Certified.

Technologies/Strategies:

- Whenever possible, select only products that are inherently non-emitting sources of VOCs.
- Specify low-VOC cleaning products for maintenance during construction.
- Refer to NYS Office of General Services (OGS) list of approved cleaners
- Use Rockwool insulation where applicable.
- Reference the *AIA Environmental Resource Guide* for further information.

Related Envision Credits:
QL2.1 Enhance Public Health and Safety
CR1.2 Reduce Air pollutant Emissions

2.3 Natural Lighting

Intent:
Implement design strategies to maximize access to daylight and views to the outdoors in a glare-free way and whenever possible integrate indoor space with the outside environment to improve IEQ for building occupants

Requirement:

1. Increase amount of natural light in all spaces; maximize daylighting as opposed to artificial lighting.
2. Minimum floor to ceiling height to be 8'-6" in offices, gym, locker rooms, and lunchroom.

Recommendations:

1. Consider locating parking below grade
2. Incorporate skylights or light tubes as part of the roof design.

Technologies/Strategies:

- Increase floor to ceiling heights, where practicable, and decrease distance of habitable spaces from windows.

Related Envision Credits:
QL2.1 Enhance Public Health and Safety

2.4 Indoor Pest Control

Intent:
Unwanted pests (such as cockroaches, mice, and rats) and their excrement may be a source for asthma, allergies, and other health concerns. The use of chemicals to rid buildings of pests can also have an adverse effect on Indoor Environmental Quality (I.E.Q.). Consequently, Integrated Pest Management (IPM) should be practiced in connection with all pest control efforts with a goal of utilizing chemical pest control methods only when engineering controls have been proven ineffective.

Requirement:

1. Use best efforts to seal, caulk, and repair points of entry, habitation, and breeding areas to mitigate against pest occurrences within the building.
2. If the use of chemicals is required in a specific instance due to the ineffectiveness of IPM, the least toxic effective chemicals are to be employed.
3. Ensure that all bids and Requests for Proposals issued for pest control services mandate the use of IPM.

Recommendations:

1. Develop an "Integrated Pest Management Plan" as part of the required "Maintenance Manual" (see §4.4) that delineates the requirements of this section.

Technologies/Strategies:

- Properly seal all penetrations (i.e. around water pipes, steam risers, electrical conduits, etc.) with copper mesh and caulking or plaster.
- Properly seal cracks and joints at tile floor/wall joints, baseboard/wall interfaces, and window frame/wall interfaces.
- Provide properly fitting door sweeps at all exterior doors and hallway doors – undercut exterior doors with less than ¼ inch clearance and provide vinyl or brush sweeps.
- Cover all ventilation portals with insect mesh (metal window screen) and ¼ inch wire mesh (hardware cloth).
- Encourage prompt repair of leaky faucets, condensation on pipes, or other sources of water in the "Maintenance Manual."
- Educate tenants in housekeeping/food storage strategies that reduce the potential for pest presence.

Related Envision Credits:
QL2.1 Enhance Public Health and Safety
NW2.2 Reduce Pesticide and Fertilizer Impacts

3.0 Conserving Materials and Resources

3.1 Storage & Collection of Recyclables

Intent:
In compliance with NYS Executive Order 04, reduce waste and divert waste streams from disposal to recycling and reuse. Facilitate the reduction of waste and the diversion of materials congruent with markets for recycling within the community that otherwise would be hauled off site and disposed into landfills.

Requirement:
1. Compliance with the requirements of NYS Executive Order 04
2. Meet all applicable requirements for recycling collection.
3. Perform an analysis to identify post-occupancy waste streams and volumes; design waste and recycling facilities and procedures to meet building-specific needs based on this analysis.
4. Provide access to recycling receptacles that is as convenient (or more convenient) than access to trash receptacles.

Recommendations:
1. Provide clear labels, using more images than text, to identify appropriate recycling and waste receptacles.
2. “Trash & Recycling” room will be ventilated and maintained within the building with adequate access to the exterior.
3. Rinse all food container(s) before recycling them for better pest management and control.
4. Provide separate environmentally controlled facilities for wet trash.

Technologies/Strategies:
- Identify and contract with licensed haulers and processors of recyclables. (Incineration is not an acceptable means of waste diversion and is not to be considered “recycling.”)
- Design designated areas in lunchrooms, locker rooms and other common spaces for the collection of recyclables.
- The easier it is to recycle, the more people will participate.

Related Envision Credits:
RA1.5 Divert Waste from Landfills
RA1.6 Reduce Excavated Materials Taken Off Site
RA1.7 Provide for Deconstruction and Recycling

3.2 Construction Waste & Resource Reuse

Intent:
In compliance with NYS Executive Order 04, reduce the amount of construction waste and conserve resources through reuse or recycling to reduce the environmental impact from material manufacturing and transport.

Requirement:
1. Compliance with NYS Executive Order 04.
2. Develop a Waste Management Plan that provides for recycling and the diversion of construction and demolition debris and recyclable materials from landfills.
3. Salvage, reuse or recycle at least 75% (by weight) of the waste generated by the project. Refer to Section 01 74 19 Construction Waste Management and Disposal specification for details.
4. In accordance with NYS Executive Order 04, and in support of the Waste Management Plan, complete and submit the Waste Management Calculator to document the quantities of recycled and/or reused material by type. (See appendix)

Recommendations:
1. Use best efforts to utilize recycled or salvaged materials during construction.
2. Consider recycling and reuse goals higher than 75% for certain projects.

Technologies/Strategies:
- Identify and contract with licensed haulers and processors of recyclables. (Incineration is not an acceptable means of waste diversion.)
- Recycle cardboards, metals, concrete, brick, asphalt, beverage containers, clean dimensional wood, plastic, glass, gypsum board, ceiling tile, carpet, oil-based paints and adhesives, electronics, bulk metals, scrap metal, and fluorescent light bulbs.
- Evaluate the cost-effectiveness of recycling rigid insulation, engineered wood products, and other materials.
- Reuse soils on site, provided that the Environmental Compliance Department concurs with the specific reuse.

Related Envision Credits:
RA1.5 Divert Waste from Landfills
RA1.6 Reduce Excavated Materials Taken Off Site
RA1.7 Provide for Deconstruction and Recycling

3.3 Recycled Content

Intent:
Reduce the use of virgin materials and avoid sending useful materials to landfills by replacing them with reused or recycled materials, or materials with recycled content.

Requirement:

1. Work with the Procurement Department to address all applicable New York State, Connecticut and MTA procurement requirements for recycled content.
2. Review NYS Office of General Services' list of Approved Specifications for Executive Order 4 compliance, available here: http://www.ogs.ny.gov/EO/4/

Recommendations:

1. Use a minimum of 25% of materials (based on cost) listed in EPA's Comprehensive Procurement Guidelines (CPG) and for materials not contained within the CPG, a minimum of 25% recycled-content (at least 10% post-consumer).

Technologies/Strategies:

- Use of recycled materials or materials with recycled content will reduce the burden on already over harvested resources.

Related Envision Credits:
RA1.3 Use Recycled Materials
RA1.5 Divert Waste from Landfills

3.4 Local/Regional Materials

Intent:
Minimize costs and environmental impacts resulting from transportation of materials. Retain regional economic benefits by supporting local/regional economy.

Requirement:

1. Work with the Procurement Department to address all applicable New York State, Connecticut, and MTA procurement requirements for Local/Regional materials.

Recommendations:

1. Set a goal of 40% of all building materials (based on cost) used to be manufactured within a 1,000 mile (by air) radius.

Technologies/Strategies:

- Strengthening a local supply chain will reduce costs and build local building technology and infrastructure.

Related Envision Credits:
RA1.4 Use Regional Materials

3.5 HCFC and CFC Elimination

Intent:
Eliminate the use of HCFC- and CFC-based refrigerants in HVAC systems, the use of insulation materials that utilize CFC's during production, and solvents that contain HCFCs and CFCs – all of which contribute to ozone depletion and GHG emissions. These products are being phased out under the Montreal Protocol.

Requirement:
1. Use HVAC equipment with no HCFCs or CFCs.
2. Avoid the use of insulation materials that utilize Chlorine-based gasses in their production process.

Recommendations:
1. Specify refrigerants with low global warming potential (GWP).

Technologies/Strategies:
- No new equipment is installed that uses CFC's.
- Phase out existing CFC equipment.
- Switch existing equipment to HFC or PFC where possible.

Related Envision Credits:
CR1.1 Reduce Greenhouse Gas Emissions
CR1.2 Reduce Air Pollutant Emissions

3.6 Alternative Transportation

Intent:
Limit contributions to pollution and the use of non-renewable energy sources for transportation by encouraging the use of public transportation, bicycles, and improved pedestrian pathways. Integrate completed project into existing public transportation network.

Requirement:

1. Refer to the MNR Station Standards and Guidelines, section 7.3 Pedestrian/Bicycle Circulation (available on the MNR intranet: http://www.mnr.org/intranet/Station-stds/public/table_of_contents.cfm)
2. Provide enclosed bicycle storage at train stations with easy access to platforms, as close as or closer than the nearest car parking area.

Recommendations:

1. Customer Service and Stations, Capital Engineering, and Capital Planning and Programming Departments will jointly determine the appropriate number and placement of bicycle racks on a project-specific basis.
2. Locate employee facilities within walking distance of public transportation (less than 1 mile using safe walking/biking route)
3. Provide for electric vehicle charging in station parking lots, ideally in premium parking spaces.

Technologies/Strategies:

- If bicycle storage is available and easily accessible, then employees and customers will be more likely to own and use bicycles for commuting needs.
- Locate bike storage convenient to platforms and work sites. (Do not locate bike storage at far end of parking lot.)
- Utilize electric powered vehicles for intra-facility transportation.
- Build multiple facilities in a campus within walking distance of each other to reduce the need for on-site vehicular use.
- Consolidate discrete functions into single, energy efficient building as much as possible.

Related Envision Credits:
QL2.4 improve Community Mobility and Access
QL2.5 Encourage Alternative Modes of Transportation
QL2.6 improve Site Accessibility, Safety, and Wayfinding
CR1.1 Reduce Greenhouse Gas Emissions

4.0 Operations & Maintenance

4.1 Building Systems and Materials

Intent: Consistent with ISO 50001:2011(E), section 4.4.6 Energy objectives, energy targets and energy management action plans and section 4.5.7 Procurement - To investigate and incorporate the latest advancements to building systems, assemblies and materials. To design and construct facilities with high quality materials offering long life, that facilitate maintenance, and that will result in the lowest operating costs over the expected life of the facility.

Requirements:

1. When procuring energy services, products and equipment that have, or can have, an impact on significant energy use, inform suppliers that procurement is partly evaluated on the basis of energy performance. Establish and implement the criteria for assessing energy use, consumption and efficiency over the planned or expected operating lifetime when procuring energy using products, equipment and services which are expected to have a significant impact on the organization's energy performance.
2. Define and document energy purchasing specifications, as applicable, for effective energy use.
3. Perform Life Cycle Cost Analyses (LCCA) on all systems and equipment. Choose systems and equipment with the lowest overall life cycle cost to minimize O&M impacts.
4. Specify equipment and materials that are the least maintenance intensive.
5. Design facilities so that equipment and materials that require periodic maintenance are easily accessible to maintenance forces.
6. Specify equipment and materials that offer longer service intervals between recommended routine maintenance.
7. Locate equipment in areas that are easily accessible (i.e. valves for water or compressed air systems).
8. Design systems with multiple points of isolation to facilitate isolation of a small portion of the larger system for routine maintenance.
9. Specify materials that offer the longest lifespan in their category.
10. Include means of access to equipment into the facility design and construction (i.e. catwalks, work platforms).
11. Utilize materials that are resistant to degradation or decay from moisture and sunlight.
12. Provide proper access to equipment located within unoccupied areas (i.e. ceiling plenums, basements, crawl spaces).
13. Allow sufficient space around equipment so it is easily accessible for maintenance.

Technologies/Strategies:

1. Investigate the latest advancements in building systems and materials during the design process and incorporate into the construction as pertinent.
2. When choosing between construction methods, assemblies, and materials, choose the ones that offer the best maintenance characteristics.
3. Utilize materials made from recycled plastics as opposed to cellulose based products.
4. Utilize fiberglass faced gypsum wallboard in lieu of paper faced wallboard.
5. When finishing tiled surfaces, utilize elastomeric sealants instead of grout wherever there is a change of plane to minimize cracking resulting from expansion/contraction and normal building movement.

6. Install fluid applied seamless flooring as opposed to sheet goods or vinyl composite tile.
7. Utilize glass as opposed to polycarbonates that are subject to yellowing and embrittlement as they age.
8. Utilize high efficiency motors with high grade oil less bearings.
9. Provide manways or catwalks to equipment mounted to the underside of high ceilings/roofs.
10. When specifying HVAC equipment, take into account ease of accessing internals for routine maintenance (i.e. coils and condensate pans easily accessible for cleaning, motors, belts, fans are accessible for routine maintenance).

Related Envision Credits:
RA1.1 Reduce Net Embodied Energy
RA1.2 Support Sustainable Procurement Practices
RA2.1 Reduce Energy Consumption

4.2 Building Systems Monitoring

Intent:
Consistent with ISO 50001:2011(E), section 4.6.1 – Monitoring, measurement and analysis - Provide means of monitoring the operation of building systems, Indoor Environmental Quality, and energy consumption via a Building Management System (BMS). Specify equipment with monitoring and feedback capabilities allowing facility operators to monitor equipment for proper operation.

Requirement:

1. Ensure that the key characteristics of operations that determine energy performance are monitored, measured and analyzed at planned intervals. Key characteristics shall include at a minimum:
    a) significant energy uses and other outputs of the energy review; b) the relevant variables related to significant energy uses;
    b) EnPIs (Energy Performance Indicators);
    c) the effectiveness of the action plans in achieving objectives and targets;
    d) evaluation of actual versus expected energy consumption.
2. In accordance with EO 88 requirements, all buildings larger than 100,000 square feet on a master metered campus, are required to have submetering installed for all fuels and other energy sources, including, but not limited to, electricity, natural gas, steam, and oil.
3. Submeters shall be permanent in nature – temporary data loggers do not count towards the submetering requirement.
4. Data from these meters will be linked to the facility's BMS as well as the MTA-wide Energy Management System and Advanced Metering Infrastructure.
5. The BMS and integrated equipment shall be capable of providing feedback on the equipment's actual operation, not just its commanded operating parameters, to identify component failures. The BMS shall be capable of providing comparative analysis and historical trending of equipment operation and energy consumption.

Recommendations:

1. Data recorded by electric submeters must be in at least 15 minute intervals.
2. Submeters should have internal data storage, or utilize an external store and forward device, to accommodate no less than 2 megabytes of data logging to hold interval measurements in the event there is a communications interruption with the base station.
3. Install and maintain a permanent monitoring system that tracks the IEQ and energy performance of the building systems and allows operators to make adjustments to maintain targets (See § 2.3.2).
4. Consider submetering large energy consumers within facilities to identify and alert facility operators of anomalies in energy consumption.

Technologies/Strategies:

- Use non-proprietary building management systems
- Use open protocols

Related Envision Credits:
RA2.1 Reduce Energy Consumption
RA2.3 Commission and Monitor Energy Systems

4.3 Commission and Monitor Building Systems

Intent:
Ensure efficient functioning and extend useful life by specifying commissioning and monitoring of the performance of building systems. Ensure consistency with ISO 50001:2011(E), section 4.5.2 Competence, training and awareness, section 4.5.5 Operational control, and with section 4.6.1 Monitoring, measurement and analysis.

Requirement:

1. Identify and plan those operations and maintenance activities which are related to its significant energy uses and that are consistent with its energy policy, objectives, targets and action plans, in order to ensure that they are carried out under specified conditions, by means of the following:
   a) establishing and setting criteria for the effective operation and maintenance of significant energy uses, where their absence could lead to a significant deviation from effective energy performance;
   b) operating and maintaining facilities, processes, systems and equipment, in accordance with operational criteria;
   c) appropriate communication of the operational controls to personnel working for, or on behalf of Metro-North.
2. Adhere to the requirements of the *MTA All-Agency Capital Program Guidelines for Commissioning & Systems Integration* document in effect at time of project design, available in the intranet at http://www.mtahq.org/capital/guidelines.html
3. Avoid conflicts of interest by engaging an independent contractor (separate from Design-Build consultant) for the initial commissioning of facility.
4. Prior to commissioning equipment, prepare a Commissioning Plan and submit to MNR QA & QC Department and maintenance departments for approval.
5. Prior to training for new equipment and systems, prepare a detailed Operations and Maintenance Manual and submit to maintenance departments for approval.
6. Determine and establish the FTEs required to perform tasks outlined in O&M Manual.
7. Provide for the recommissioning of systems one (1) year after initial commissioning to ensure the continued proper operation of equipment

Recommendations:

1. Establish a “Commissioning Team” at the beginning of Preliminary Engineering to participate in the design process with continued involvement for one full year beyond initial occupancy.

Technologies/Strategies:

- Ensure equipment meets design specifications. Typically, fans, pumps, motors, and other equipment are installed that don’t meet design specifications. The result is inferior performance, reduced indoor air quality, and increased energy consumption.
- Introduce standards and design strategies into the design process early.
- Incorporate and clearly state design intentions and requirements in the project construction documents.
- Tie contractor final payments to documented system performance.
- Provide a detailed training program for operating engineers(s) and staff.
- Provide a framework for periodic retraining for existing and new staff at 6 months, 1 year, and 2 year intervals as part of the O&M plan delivered upon project completion.

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Related Envision Credits:
RA2.1 Reduce Energy Consumption
RA2.3 Commission and Monitor Energy Systems

4.4 Maintenance Accountability

Intent:
Consistent with ISO 50001:2011(E), section 4.5.2 Competence, training and awareness, section 4.5.3 Communication, section 4.5.5 Operational control, and section 4.5.7 Procurement – Work with Maintenance personnel to provide for maintenance and operational continuity by choosing systems with lowest life cycle cost, determining the appropriate FTEs (Full Time Employees) to maintain equipment, and establishing a system that guarantees accountability for maintaining performance standards.

Requirement:

1. Ensure that any person(s) working for or on behalf of Metro-North Railroad, related to significant energy uses, are competent on the basis of appropriate education, training, skills or experience. Identify training needs associated with the control of significant energy uses and the operation of EnMS. Provide training or take other actions to meet these needs.
2. Ensure that any person(s) working for or on behalf of Metro-North Railroad are aware of:
    a) the importance of conformity with the energy policy, procedures and the requirements of the EnMS;
    b) their roles, responsibilities and authorities in achieving the requirements of the EnMS;
    c) the benefits of improved energy performance; the impact, actual or potential, with respect to energy use and consumption, of their activities and how their activities and behavior contribute to the achievement of energy objectives and targets, and the potential consequences of departure from specified procedures.
3. A “Maintenance Manual” will be prepared and submitted for review. It will subsequently be made available to all maintenance staff. The manual will include best practices for maintenance and housekeeping, building systems descriptions (include model numbers if applicable), manufacturers’ literature, and best practices for pest management and will assign accountability for maintenance.
4. Persons responsible for maintaining building systems are to be involved in the design, selection, and commissioning of all equipment.

Recommendations:

1. Establish educational programs to accommodate staff turnover.
2. Institute a preventive maintenance program.

Technologies/Strategies:

- Regularly replace filters and calibrate equipment to maintain energy performance targets.
- Use non-toxic, environmentally-responsible cleaning materials that minimize the impact to indoor air quality.

Related Envision Credits:
RA2.1 Reduce Energy Consumption
RA2.3 Commission and Monitor Energy Systems

5.0 Water Conservation and Site Management

5.1 Stormwater Management

Intent:
Minimize the impact of infrastructure on stormwater runoff quantity and quality. Minimize the use of potable water for maintenance and landscaping purposes by treating and recycling water and minimize the impact of stormwater on local stormwater systems.

Requirement:

1. Comply with the New York State Department of Environmental Conservation General Stormwater Permit Requirements for construction projects related to the development of sediment and erosion controls and post-construction water quality/quantity treatment.

Recommendations:

1. Provide for 50% of all roof and setback rainwater to be collected for maintenance and landscape irrigation by providing on site storage, treatment, and infrastructure.
2. Reuse rainwater and/or graywater where appropriate.
3. Consider locating parking below grade and utilizing roof areas for water collection.
4. Provide appropriate stormwater quality measures for runoff from paved areas

Technologies/Strategies:

- Use collected rainwater and/or graywater in train car wash systems and other applications throughout facilities, as appropriate
- Limit to the extent possible increases in impervious surfaces and employ pervious surface instead when practicable (e.g. concrete pavers, pervious pavement, etc.)

Related Envision Credits:
NW2.1 Manage Stormwater

5.2 Reduce Potable Water Consumption

Intent:
Minimize the impact on local water supply systems, stormwater and sewer systems and minimize the use of potable water by reducing water consumption.

Requirement:

1. For new construction, install fixtures and fittings that reduce aggregate water consumption by 20% from the baseline. See Appendix for "Baseline water consumption of fixtures and fittings."
2. For existing building rehabilitation, attempt to use low flow fixtures wherever possible, based on existing plumbing.
3. Consider installing waterless urinals.

Recommendations:

1. Install WaterSense fixtures where applicable
2. Reduce process water for heat rejection and cooling, cooling towers, and evaporative condensers.
3. Provide infrastructure for graywater system (separate piping, pumps, and valves) for use for vehicle maintenance, landscape, and other applicable purposes.

Technologies/Strategies:

- Recycle water from vehicle maintenance facilities to graywater system.
- Provide clearly labeled graywater taps at exterior of building for maintenance, sidewalk washing, and landscaping needs
- Capture graywater for reuse when applicable.
- Consider waterless urinals/tankless toilets, composting/waterless toilets and any other low-flow fixtures and fittings.

Related Envision Credits:
RA3.1 Protect Fresh Water Availability
NW2.1 Manage Stormwater

5.3 Water Efficient & Responsible Landscaping Practices

Intent:
Minimize the use of potable water for building and grounds maintenance, and avoid using pesticides, herbicides, or fertilizers that may pollute the environment.

Requirement:

1. Specify plantings to be those that (depending on graywater availability) require low amounts of water and are pest- and disease-resistant (refer to New York City Department of Parks and Recreation requirements).
2. Specify naturally-occurring plants and trees that are maintenance-free over the long term and that are beneficial to the micro-climate.

Recommendations:

1. Use captured rainwater and/or graywater for landscaping.
2. Use non-toxic pesticides, herbicides, and fertilizers.

Technologies/Strategies:

- Employ best practices for landscape development by properly establishing plantings, using pesticides as a last resort with an Integrated Pest Management program, and by avoiding highly water-soluble pesticides.
- Employ best practices for landscape development by incorporating designs for stormwater management

Related Envision Credits:
RA3.1 Protect Fresh Water Availability
NW2.1 Manage Stormwater
NW2.2 Reduce Pesticide and Fertilizer Impacts

5.4 Landscape and Roof Design to Reduce "Urban Heat Island Effect"

Intent:
Minimize contribution to "Heat Islands" (thermal gradient differences between developed and undeveloped areas) by reducing localized heat accumulation from roofing, pavement and other dark materials.

Requirement:

1. All roof areas to use roof materials with an Albedo value of at least 0.3, or a SRI (Solar Reflectance Index) of 29 or greater. (Blacktop has an SRI of 0, while a white surface has an SRI of 100).

Recommendations:

1. Evaluate the lifecycle costs and feasibility of installing green roofs. Must include a detailed maintenance plan/contract for green roof if it is included in final design.
2. Landscape with trees that will provide shade within 5 years from project completion.

Technologies/Strategies:

- Provide vegetated surfaces such as green roofs and/or grass paving systems that are water efficient.
- Provide trees to shade exposed surfaces.
- Use low Albedo roofing and roof paving materials.

Related Envision Credits:
CR2.5 Manage Heat Island Effects
RA2.1 Reduce Energy Consumption

6.0 Climate Resiliency Overview

"Resilience is the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a potentially hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures."

-Intergovernmental Panel on Climate Change (IPCC), *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* (Lavell et al., 2012).

The intent of this section is to provide guidance for capital projects to better protect Metro-North's infrastructure from natural hazards, such as increased temperatures, precipitation, severe storms and higher sea levels, and provide the ability to recover more quickly from unpreventable damages.

Anticipated climate impacts shall be addressed when designing Metro-North infrastructure and buildings. Design adjustments should be made related to increased occurrences of extreme temperatures, increased precipitation, sea level rise and severe storms.

The New York-New Jersey-Connecticut region has several guidance documents and research papers concerning anticipated impacts of future climate change. Most notably, the New York City Panel on Climate Change (NPPC) was established in 2008. The NPCC's guidance is generally applicable to a 100 mile radius from New York City and can therefore be utilized by Metro-North with confidence.

Following Hurricane Sandy, The City convened the Second NPCC (NPCC2) in January 2013 to provide up-to-date scientific information and analyses in order to better respond to increasing climate risks and inform the rebuilding process. The NPCC released updated climate projections in June 2013, providing quantitative and qualitative information about future climate hazards for the 2020s and 2050s. In January 2015, the NPCC2 report was published through the Annals of the New York Academy of Sciences (NPCC 2015), representing the full work of the NPCC2 from January 2013 through January 2015.[1] The NPCC 2015 report provides information about future climate hazards for 2020s through 2100 for temperature, precipitation and sea level rise as well as extreme events. These latest projections were derived utilizing the most recent global climate models, observations about climate trends, and new information about greenhouse gas emissions. It includes a mid-range projection (25th to 75th percentile) and a high-estimate projection (90th percentile).These are summarized in tables 6.1 and 6.2 below.

Additionally, in January of 2016, New York State adopted recommended sea level rise projections as required by the Community Risk and Resiliency Act (CRRA).

[1] Horton, R., Bader, D., Kushnir, Y., Little, C., Blake, R. and Rosenzweig, C. (2015), *New York City Panel on Climate Change 2015 Report Chapter 1: Climate Observations and Projections*. Ann. N.Y. Acad. Sci., 1336: 18–35. doi:10.1111/nyas.12586

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Table 6.1 Baseline Climate and Mean Annual Changes

Mean Annual Changes									
	Baseline (1971-2001)	2020s		2050s		2080s		2100s	
		Mid-Range	High Estimate	Mid-Range	High Estimate	Mid-Range	High Estimate	Mid-Range	High Estimate
Air Temperature	54^{0}F (annual mean)	+ 2^{0}F to 2.9^{0}F	+ 3.2^{0}F	+ 4.1^{0}F to 5.7^{0}F	+ 6.6^{0}F	+ 5.3^{0}F to 8.8^{0}F	+ 10.3^{0}F	+ 5.8^{0}F to 10.3^{0}F	+ 12.1^{0}F
Precipitation	50.1 inches	+ 1 - 8%	+ 10%	+ 4 - 11%	+ 13%	+ 5 - 13%	+ 19%	+ 1 - 19%	+ 25%
Sea Level Rise	2000-2004	+ 4 in to 8 in	+ 10 in	+ 11 in to 21 in	+ 30 in	+ 18 in to 39 in	+ 58 in	+ 22 in to 50 in	+ 75 in

New York City Panel on Climate Change 2015 Report

Table 6.2 Baseline Climate and Changes to Extreme Events

Changes to Extreme Events									
	Baseline (1971-2001)	2020s		2050s		2080s		2100s	
		Mid-Range	High Estimate	Mid-Range	High Estimate	Mid-Range	High Estimate	Mid-Range	High Estimate
Temperature									
Days/year at or above 90^{0}F	18 per year	26 to 31	33	39 to 52	57	44 to 76	87	Not available	
Days/year at or above 100^{0}F	0.4 per year	1 to 2	2	3 to 5	7	4 to 14	20		
Days/year at or below 32^{0}F	71 per year	52 to 58	60	42 to 48	52	30 to 42	49		
Heat waves	2 per year	3 to 4	4	5 to 7	7	6 to 9	9		
Heat wave duration	4 days	5	5	5 to 6	6	5 to 7	8		
Precipitation									
Rainfall Intensity (Days/year with rainfall at or above 1 inch)	13 day	14 to 15	16	14 to 16	17	15 to 17	18	Not available	
Rainfall Intensity (Days/year with rainfall at or above 2 inches)	3 days	3 to 4	5	4	5	4 to 5	5		
Rainfall Intensity (Days/year with rainfall at or above 4 inches)	0.3 days	0.3 to 0.4	0.5	0.3 to 0.4	0.5	0.3 to 0.5	0.7		

New York City Panel on Climate Change 2015 Report

The New York City Panel on Climate Change finds that, the frequency and intensity of events will increase for storms, precipitation, and temperature. While these changes may be modest through the 2020s, they will become distinctly measurable by 2050s and later. With this in mind, projects should be designed for the projected climate conditions at their anticipated end of life. For example, a facility with a 60-year useful life, should look to projections for the 2080s during the design phase.

The following subsections target a mid-range estimate from the table above for each timescale which should be applied to all capital projects.

6.1 Temperature Change Guidance

Designs for facilities, infrastructure and equipment should account for the following temperature changes over the assets' design life.

Table 6.3

Temperature Guidance	Baseline (1971-2001)	2020s	2050s	2080s
Mean Annual Air Temperature	54^0F	56.4^0F	59^0F	61^0F
Days at or above 90^0F	18 days/year	29	46	60
Days at or below 32^0F	72 days/year	55	45	36
Heat Waves	2 /year	4	6	7
Heat Wave Duration	4 days	5	5	6

New York City Panel on Climate Change 2015 Report

6.2 Precipitation Change Guidance

Designs for facilities, infrastructure and equipment should account for the following precipitation changes over the assets' design life.

Table 6.4

Precipitation Guidance	Baseline (1971-2001)	2020s	2050s	2080s
Mean Annual Precipitation	50.1"	54"	58"	60"
Rainfall Intensity (Days/year with rainfall ≥ 2 in)	3 days/year	3	4	4

New York City Panel on Climate Change 2015 Report

6.3 Sea Level Rise Guidance

Many Metro-North facilities and large portions of the right of way are located in low-lying areas near tidal waterways. For example, the Hudson River is tidal as far north as Albany so the effects of sea level change could be felt along the Hudson Line. Designs for facilities, infrastructure and equipment should account for the following estimates in sea level.

Table 6.5

Sea Level Rise Guidance	Baseline (1971-2001)	2020s	2050s	2080s	2100s
Sea Level Rise	(baseline)	+6 inches	+16 inches	+29 inches	+36 inches

New York City Panel on Climate Change 2015 Report

6.4 Design Flood Elevations

Following Super Storm Sandy in 2012, MNR developed new Design Flood Elevations to guide the repair and restoration of our infrastructure. These guidelines consider the latest FEMA floodplain maps and the updated climate change projections described in this section. Capital projects shall refer to the most recent *Metro-North Commuter Railroad Post Super Storm Sandy Design Flood Elevations to Protect Infrastructure from Future Storm Surge Flooding* document for project planning and design. A companion document, the *Track and Asset Inundation Map Book,* is another resource available to project staff to help understand flood risk to MNR infrastructure. Both documents are available on the MTA's climate site: http://climate.mtahq.org/mnr-documents

Publications:

American Institute of Architects. *AIA Environmental Resource Guide*. New York: McGraw-Hill, 1995.

Barnett, Dianna Lopez and William Browning. *Primer on Sustainable Building*. Rocky Mountain Institute, 1995

City of New York Department of Design And Construction (DDC). *High Performance Building Guidelines*. 1999.

Johnson, Tim. *Low E Glazing Design Guide*. Boston: Butterworth, 1991.

Hays, Steve et al. *Indoor Air Quality*. New York: McGraw-Hill, 1995.

Institute for Sustainable Infrastructure. *ENVISION Rating System for Sustainable Infrastructure (EVISION®).* 2015.

Horton, R., Bader, D., Kushnir, Y., Little, C., Blake, R. and Rosenzweig, C. (2015), *New York City Panel on Climate Change 2015 Report Chapter 1: Climate Observations and Projections*. Ann. N.Y. Acad. Sci., 1336: 18–35. doi:10.1111/nyas.12586

Lavell, A. et al. *Climate change: new dimensions in disaster risk, exposure, vulnerability, and resilience*. pp. 34. 2012.

Olgyay, Victor. *Design With Climate*. Princeton: Princeton University Press, 1973.

Rocky Mountain Institute. *Green Development: Integrating Ecology And Real Estate.* New York: John Wiley & Sons, Inc., 1998.

Tuluca, Adrian (Steve Winter and Associates, Inc.). *Energy Efficient Design and Construction for Commercial Buildings*. New York: McGraw-Hill, 1997.

Watson, Donald and Kenneth Labs. *Climatic Building Design*. New York: McGraw-Hill, 1983.

The Climate Registry. *General Reporting Protocol version 2.0.* 2013.

US Green Building Council. *Leadership in Energy and Environmental Design Green Building Rating System Criteria (LEED™)*. 1999.

Metro-North Capital Guideline
Guideline CPG-F.8: Sustainable Infrastructure Design Version 003

Web Resources:

American Council for an Energy-Efficient Economy	http://www.aceee.org/
Energy Efficiency and Renewable Energy Network (EREN)	http://www.eren.doe.gov/
Energy Star Program (U.S. EPA)	http://www.energystar.gov/
Environmental Building News	http://www.ebuild.com/
Environmental Defense Fund	http://www.edf.org/
Iris Communications – Resource for Environmental Design Index	http://www.oikos.com/
Institute for Sustainable Infrastructure (Envision information)	https://www.sustainableinfrastructure.org/rating/
MTA Climate Resiliency Intranet resources (A*vailable only to MTA employees from internal network)*	http://climate.mtahq.org/
National Resources Defense Council	http://www.nrdc.org/
New Jersey Department of Environmental Protection	http://www.state.nj.us
New York State Department of Environmental Conservation	http://www.dec.ny.gov/
New York State Energy and Research Development Authority	http://www.nyserda.org/
Rocky Mountain Institute	http://www.rmi.org/
Scientific Certification Systems	http://www.scs1.com/
Southface Energy Institute	http://www.southface.org/
US Department of Energy	http://www.doe.gov/
US Environmental Protection Agency	http://www.epa.gov/
US Green Building Council (LEED information)	http://www.usgbc.org/
WaterSense®	https://www3.epa.gov/watersense/

Glossary

The following is a partial glossary of terms from the City of New York Department of Design And Construction's (DDC) *High Performance Building Guidelines*.

Albedo: The ratio of reflected light to the total amount falling on a surface. A high Albedo indicates high reflectance properties. It is dimensionless and measured on a scale from zero (corresponding to a black body that absorbs all incident radiation) to one (corresponding to a white body that reflects all incident radiation).

Building Commissioning: A systematic process beginning in the design phase, lasting at least one year after construction, and including the preparation of operating staff of ensuring, through documented verification, that all building systems perform interactively according to the documented design intent and the owner's operational needs.

Chlorofluorocarbons: CFCs are a family of chemicals used in refrigeration, air conditioning, packaging, insulation, or as solvents and aerosol propellants. Because CFCs are not destroyed in the lower atmosphere they drift into the upper atmosphere where their chlorine components destroy the earth's protective ozone layer.

Climate change: A regional change in temperature and weather patterns. Current science indicates a discernible link between climate change over the last century and human activity, specifically the burning of fossil fuels.

Composting: A process whereby organic wastes, including food wastes, paper, and yard wastes, decompose naturally, resulting in a product rich in minerals and ideal for gardening and farming as a soil conditioner, mulch, resurfacing material, or landfill cover.

Daylighting: The method of illuminating building interiors with natural light.

Demand Controlled Ventilation: Ventilation provided in response to actual number of occupants and occupant activity.

Design Charrette: The charrette process is a focused workshop(s) which takes place in the early phase of the design process. All project team members meet together to exchange ideas, encouraging generation of integrated design solutions.

Energy Modeling: A computer model that analyzes a building's energy related features in order to project energy consumption.

Global Warming Potential (GWP): The ratio of radiative forcing (degree of warming to the atmosphere) that would result from the emission of one unit of a given GHG compared to one unit of carbon dioxide (CO2).

Graywater: Wastewater that does not contain sewage or fecal contamination and can be reused for irrigation after simple filtration.

Hydrochlorofluorocarbon: HCFCs are generally less detrimental to depletion of stratospheric ozone than related chlorofluorocarbons (CFCs). HCFCs are generally used to replace CFCs where mandates require CFCs to be eliminated. A total ban on CFCs and HCFCs is scheduled effective 2030.

Integrated Pest Management: A coordinated approach to pest control that is intended to prevent unacceptable levels of pests by the most cost-effective means with the least possible hazard to building occupants, workers, and the environment.

Life Cycle Cost Analysis: Uses the amortized annual cost of a product, including capital costs, installation costs, operating costs, maintenance costs, and disposal costs discounted over the lifetime of the product to develop a comprehensive examination of a product's environmental and economic aspects and potential impacts throughout its lifetime, including raw material extraction, transportation, manufacturing, use and disposal.

Low-E windows: "Low-E" (Low-Emissivity) windows reflect heat, not light, and therefore keep spaces warmer in the winter and cooler in the summer.

Operations & Maintenance: Operations refers to how equipment or systems are run, e.g., when a system should be turned on, temperature ranges, set points for boiler pressures and temperatures, thermostat set points, etc. Maintenance refers to servicing or repair of equipment and systems. "Preventive maintenance" performed on a periodic basis to ensure optimum life and performance is designed to prevent breakdown and unanticipated loss of production or performance. "Corrective" or "unscheduled" maintenance refers to repairs on a system to bring it back "on-line." "Predictive" maintenance is performed on equipment monitored for signs of wear or degradation, e.g., through thermography, oil analysis, vibration analysis, maintenance history evaluation.

Photovoltaic Panels: PV devices use semiconductor material to directly convert sunlight into electricity. Power is produced when sunlight strikes the semiconductor material and creates an electric current.

Post-consumer Recycled Content: Post-consumer material is material or finished product that has served its intended use and has been discarded for disposal or recovery, having completed its life as a consumer item.
Pre-consumer Recycled Content: Pre-consumer material is material diverted from the waste stream following an industrial process, excluding reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process. Synonyms include post-industrial and secondary material.

R-value: A measure of the thermal resistance of material.

Recycling: The series of activities, including collection, separation, and processing, by which products or other materials are recovered from the solid waste stream for use in the form of raw materials in the manufacture of new products other than fuel for producing heat or power by combustion.

Renewable Energy: Energy resources such as wind power or solar energy that can keep producing indefinitely without being depleted.

Urban Heat Island Effect: The additional heating of air over city as the result of the replacement of vegetated surfaces with those composed of asphalt, concrete, rooftops and other man-made materials. These materials store much of the sun's energy, producing a dome of elevated air temperatures up to 10°F greater over city compared to air temperatures over adjacent rural areas. Light colored rooftops and lighter colored pavement can help to dissipate heat by reflecting sunlight, and tree planting can further help modify the city's temperature through shading and evapotranspiration.

Volatile Organic Compounds: Volatile organic compounds (VOCs) are chemicals that contain carbon molecules and are volatile enough to evaporate from material surfaces into indoor air at normal room temperatures (referred to as off-gassing). Examples of building materials that may contain VOCs include, but are not limited to: solvents, paints adhesives, carpeting and particleboard. Signs and symptoms of VOC exposure may include eye and upper respiratory irritation, nasal congestion, headache and dizziness.

VOC Content Limits for Adhesives, Sealants, Adhesive Primers, Sealant Primers and Adhesives Applied to the Listed Substrates

NYS Requirements: 6 CRR-NY 228-2.4

Adhesive, sealant, adhesive primer or sealant primer category	VOC content limit (grams per liter)
Adhesives	
ABS welding	400
Ceramic tile installation	130
Computer diskette jacket manufacturing	850
Contact bond	250
Contact bond -- specialty substrate	250
Cove base installation	150
CPVC welding	490
Indoor floor covering installation	150
Metal to urethane/rubber molding or casting	850
Multipurpose construction	200
Nonmembrane roof installation/repair	300
Other plastic cement welding	510
Outdoor floor covering installation	250
PVC welding	510
Single-ply roof membrane installation/repair	250
Structural glazing	100
Thin metal laminating	780
Tire retread	100
Perimeter bonded sheet vinyl flooring installation	660
Waterproof resorcinol glue	170
Sheet-applied rubber installation	850
Sealants	
Architectural	250
Marine deck	760
Nonmembrane roof installation/repair	300
Roadway	250
Single-ply roof membrane	450
Other	420
Adhesive Primers	
Automotive glass	700
Plastic cement welding	650
Single-ply roof membrane	250
Traffic marking tape	150
Other	250
Sealant Primers	
Non-porous architectural	250
Porous architectural	775
Marine deck	760
Other	750
Adhesives Applied to the Listed Substrate	
Flexible vinyl	250
Fiberglass	200
Metal	30
Porous material	120
Rubber	250
Other substrates	250

Global Warming Potentials

Global Warming Potential (GWP) factors represent the ratio of the heat-trapping ability of each Greenhouse Gas relative to that of carbon dioxide. For example, the GWP of methane is 21 because one metric ton of methane has 21 times more ability to trap heat in the atmosphere than one metric ton of carbon dioxide. Different refrigerants (hydroflourocarbons HFCs and perfluorocarbons - PFCs), have very different global warming potentials. Where feasible, the refrigerant with the lowest GWP should be chosen.

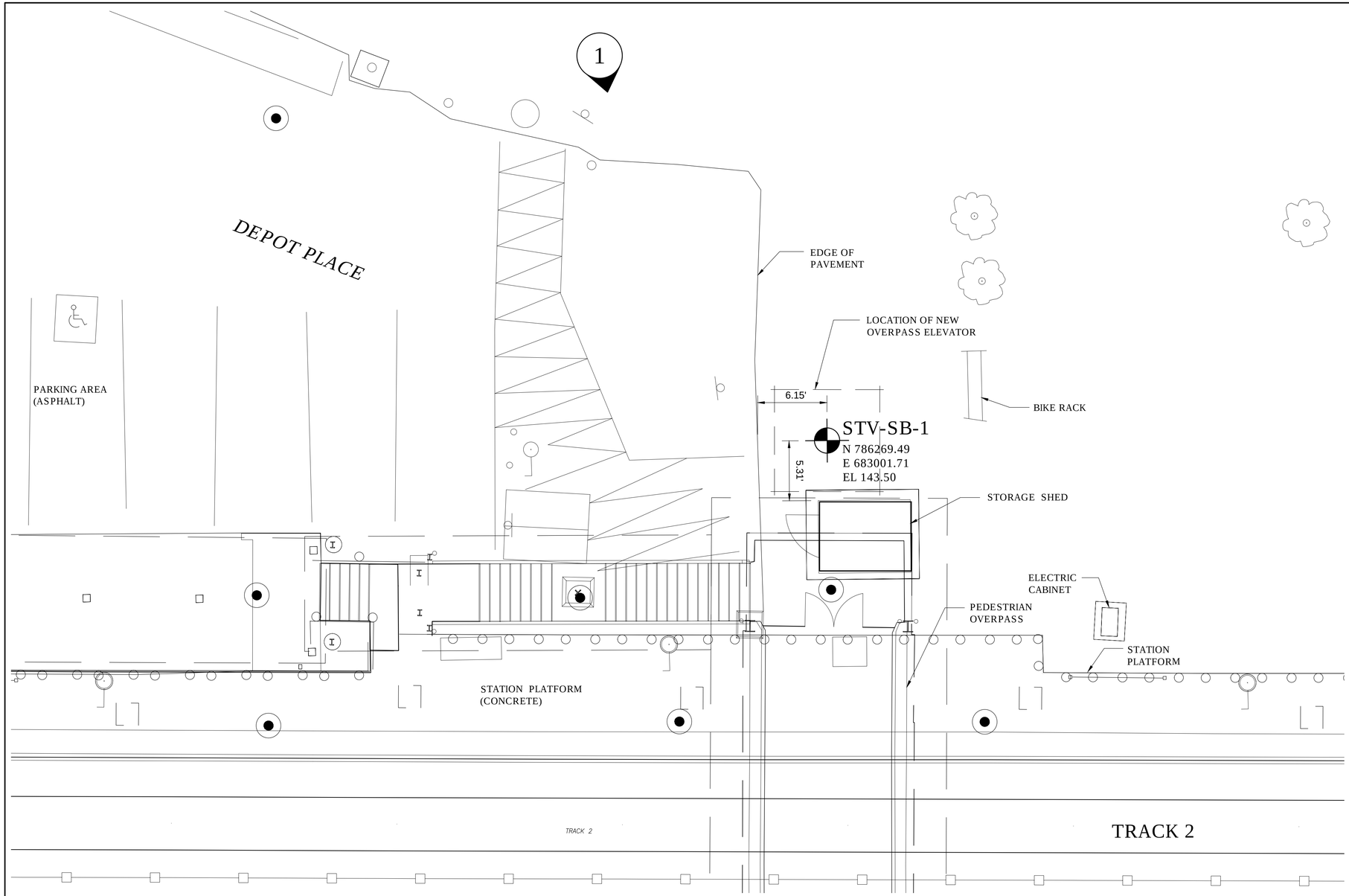
Common Name	Formula	Chemical Name	GWP
Hydrofluorocarbons (HFCs)			
HFC-23 (R-23)	CHF3	trifluoromethane	11,700
HFC-32 (R-32)	CH2F2	difluoromethane	650
HFC-41 (R-41)	CH3F	fluoromethane	150
HFC-43-10mee (R-4310)	C5H2F10	1,1,1,2,3,4,4,5,5,5- decafluoropentane	1,300
HFC-125 (R-125)	C2HF5	pentafluoroethane	2,800
HFC-134 (R-134)	C2H2F4	1,1,2,2-tetrafluoroethane	1,000
HFC-134a (R-134a)	C2H2F4	1,1,1,2-tetrafluoroethane	1,300
HFC-143 (R-143)	C2H3F3	1,1,2-trifluoroethane	300
HFC-143a (R-143a)	C2H3F3	1,1,1-trifluoroethane	3,800
HFC-152 (R-152)	C2H4F2	1,2-difluoroethane	43*
HFC-152a (R-152a)	C2H4F2	1,1-difluoroethane	140
HFC-161 (R-161)	C2H5F	fluoroethane	12*
HFC-227ea (R-227ea)	C3HF7	1,1,1,2,3,3,3- heptafluoropropane	2,900
HFC-236cb (R-236cb)	C3H2F6	1,1,1,2,2,3-hexafluoropropane	1,300*
HFC-236ea (R-236ea)	C3H2F6	1,1,1,2,3,3-hexafluoropropane	1,200*
HFC-236fa (R-236fa)	C3H2F6	1,1,1,3,3,3-hexafluoropropane	6,300
HFC-245ca (R-245ca)	C3H3F5	1,1,2,2,3-pentafluoropropane	560
HFC-245fa (R-245fa)	C3H3F5	1,1,1,3,3-pentafluoropropane	950*
HFC-365mfc	C4H5F5	1,1,1,3,3-pentafluorobutane	890*
Perfluorocarbons (PFCs)			
Perfluoromethane	CF4	tetrafluoromethane	6,500
Perfluoroethane	C2F6	hexafluoroethane	9,200
Perfluoropropane	C3F8	octafluoropropane	7,000
Perfluorobutane	C4F10	decafluorobutane	7,000
Perfluorocyclobutane	c-C4F8	octafluorocyclobutane	8,700
Perfluoropentane	C5F12	dodecafluoropentane	7,500
Perfluorohexane	C6F14	tetradecafluorohexane	7,400

Source: Adapted from The Climate Registry General Reporting Protocol 2.0.

Baseline water consumption of fixtures and fittings

Commercial Fixtures, Fittings, and Appliances	Current Baseline (IP Units)	Current Baseline (SI units)
Water closets (toilets)*	1.6 gallons per flush (gpf)	6 liters per flush (lpf)
Urinal*	1.0 (gpf)	3.8 lpf
Public lavatory (restroom) faucet	0.5 gpm at 60 psi all others except private applications	1.9 lpm at 415 kPa, all others except private applications
Private lavatory faucet*	2.2 gpm at 60 psi	8.3 lpm at 415 kPa
Kitchen faucet (excluding faucets used exclusively for filling operations)	2.2 gpm at 60 psi	8.3 lpm at 415 kPa
Showerhead*	2.5 gpm at 80 psi per shower stall	9.5 lpm at 550 kPa per shower stall

*** WaterSense label available for this product type**
gpf = gallons per flush
gpm = gallons per minute
psi = pounds per square inch
lpf = liters per flush
lpm = liters per minute
kPa = kilopascals

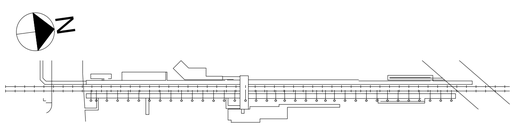


BORING LOCATION PLAN

SCALE: 1"= 5'

PHOTO LOCATION

SCALE: NTS



100% FINAL SUBMISSION

DESIGNED	RB
DRAWN	SR
CHECKED	JS
APPROVED	MM

NO.	DATE		DRWN	CHKD	APPVD

REVISION

NO.	DATE	CONFORMED	DRWN	CHKD	APPVD

REVISION

STV 100 Years
225 PARK AVENUE SOUTH,
NEW YORK, NY 10003

MTA Metro-North Railroad
420 Lexington Avenue
New York, NY 10017

TITLE
HARTSDALE AND SCARSDALE STATION IMPROVEMENTS

BORING LOCATION PLAN

SCARSDALE STATION

CONTRACT NO.
1000106733

SCALE

DATE
08/23/2019

DRAWING NO.
SCD-GE-000

SHEET 1 OF ***

STV 100 Years BORING LOG

BORING NUMBER:STV-SB-1
SHEET NUMBER: 1 of 1
CONTRACT NUMBER: 1000106733

PROJECT: Scarsdale and Hartsdale Station Improvements
LOCATION (City/State): Scarsdale, NY
CLIENT: Metro-North Railroad
CONTRACTOR: Aqulfer Drilling & Testing Inc.

LOCATION: Scarsdale Station
COORD.: N: 786269.49 E: 683001.71
SURFACE ELEV.: 143.5 ft.
DATUM: NAVD 88

DRILLER: Mike Beveridge
INSPECTOR: Max Korngold
DRILLING METHOD:Mud Rotary
RIG TYPE:CME-55-LCT

START DATE: 6/21/19 TIME: 12:50 pm
FINISH DATE: 6/21/19 TIME: 5:30 pm

	Casing	Split Spoon	Shelby Tube	Dennison	Grab	Core Barrel
Type/Symbol	Steel	S	U	D	G	C
I.D.		2 in.				2 3/8 in.
O.D.		1 3/8 in.				2 in.
Length	5 ft.	2 ft.				5 ft.
Hammer Wt.	140 lbs	140 lbs	Drill Rod Size/ I.D.(O.D.)			
Hammer Fall	30"	30"	Hammer Type		Automatic	

GROUNDWATER DATA

Date	Time	Water Depth (ft)	Casing Depth (ft)	Hole Depth (ft)
6/21/19	4:00 pm	Dry	10	10

DEPTH (feet)	GRAPHIC LOG	CASING (Blows/ft) CORING (Min./ft)	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE SYMBOL	SAMPLE DEPTH (feet)	SOIL (Blows/6 In.) 0/6	6/12	12/18	18/24	REC. (in.)	CORING RUN (in.)	CORING REC. (in.)	CORING REC. %	CORING L>4" (in.)	CORING RQD %	FIELD CLASSIFICATION AND REMARKS
						0.0 - 5.0	H	A	N	D							Grey-Brown cf SAND, trace (+) cf Gravel, trace (-) silt, plant roots near surface. 3.3ft: Tan cf SAND, trace (+) cf Gravel, trace (-) silt.
5			S	1		5.0 - 7.0	3	5	12	15	10						Grey cf SAND, trace f Gravel, trace (-) silt.
			S	2		7.0 - 9.0	16	18	22	26	9.5						cf GRAVEL, some (+) cf Sand, fragments of bedrock. Decomposed rock encountered at 9 ft.
			S	3		9.0 - 9.3	100/4"				4						DECOMPOSED ROCK
10		6.75	C	1		9.3 - 10.0 10.0 - 15.0	60	60	100	52	86						Could not advance split spoon through decomposed rock. Advance auger until refusal at 10 ft. GNEISS, white-grey, medium, slightly weathered, RQD = 86%.
		6.50															
		4.90															
		6.00															
15		6.30															End of Boring at 15 ft.

RED LINE BORING LOG SCARSDALE.GPJ LIB_LIBRARY_QA\CORRECTED N VALUES\GLB 6/24/19

Rev01
Notes:

Boring No. STV-SB-1 Sheet 1 of 1

100% FINAL SUBMISSION

DESIGNED	RB
DRAWN	SR
CHECKED	JS
APPROVED	MM

NO.	DATE		DRWN	CHKD	APPVD
		REVISION			

NO.	DATE	CONFORMED	DRWN	CHKD	APPVD
		REVISION			

STV 100 Years
225 PARK AVENUE SOUTH,
NEW YORK, NY 10003

Metro-North Railroad
420 Lexington Avenue
New York, NY 10017

TITLE
HARTSDALE AND SCARSDALE STATION IMPROVEMENTS
BORING LOG
SCARSDALE STATION

CONTRACT NO. 1000106733
SCALE
DATE 08/23/2019
DRAWING NO. SCD-GE-001
SHEET 2 OF ***

Stemmer, Julia R.

From:	Delgado, Daniel <DDelgado@mnr.org>
Sent:	Thursday, May 17, 2018 1:30 PM
To:	Diehl, Stephen E.
Cc:	Moskowitz, Michael; Donahue, Thomas; Robert Hoffmann
Subject:	Hartsdale Culvert
Attachments:	28_1_2014_19_30_24.jpg; 25_4_2016_8_33_27.jpg; HA 20.60 Bottom Half of document.pdf

Steve,

I have found the as-built and photographs of the culvert in question. It feeds into two pipes on the east end.

Thanks,
Dan

Daniel Delgado
Associate Engineer
Capital Programs
Special Projects

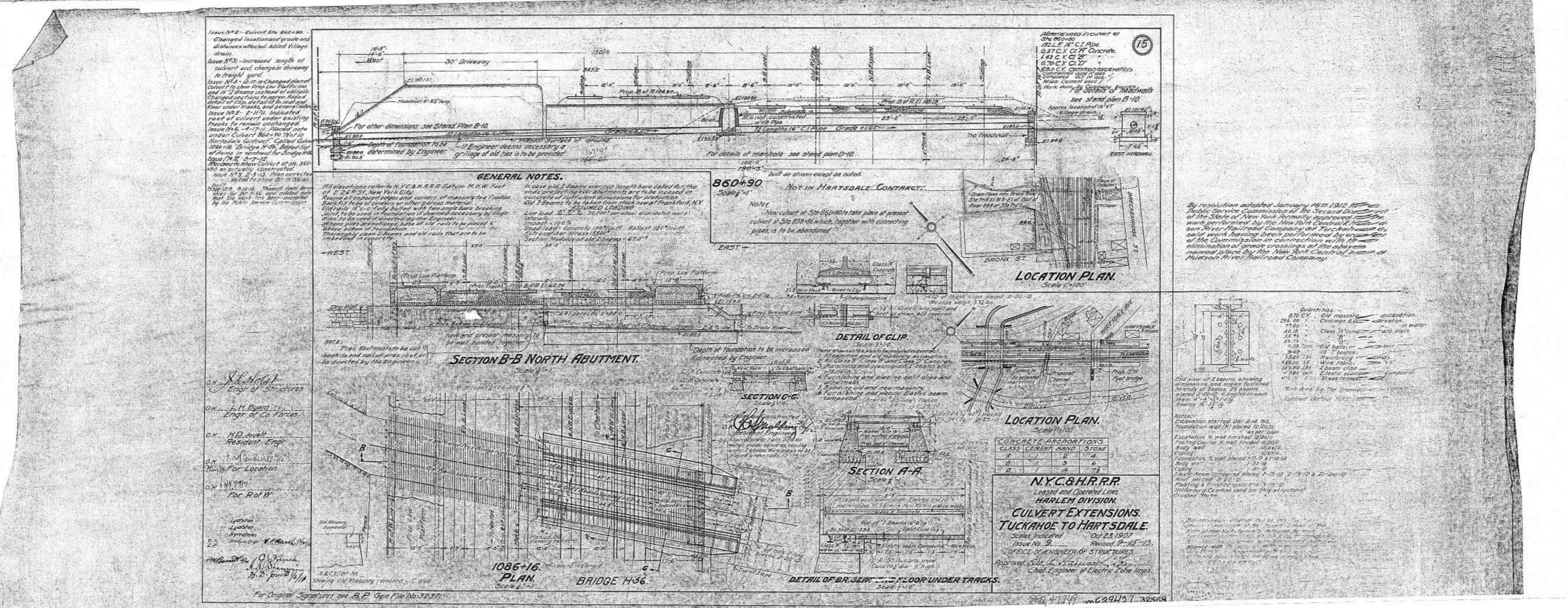
Metro-North Railroad

525 N. Broadway
White Plains, NY 10603
914-461-0510 Tel
973-951-7943 Cell
ddelgado@mnr.org

A-200

04.18.2016


01.15.2014



GENERAL NOTES.
860+90
Scale 1/8"=1'
NOT IN HARTSDALE CONTRACT.
SECTION B-B NORTH ABUTMENT.
DETAIL OF CLIP.
SECTION C-C.
SECTION A-A.
LOCATION PLAN.
Scale 1"=100'
LOCATION PLAN.
BRONX ST.
1086+16.
PLAN.
BRIDGE H-56.
DETAIL OF BR. SEAT AND FLOOR UNDER TRACKS.
For Original Signatures see B.P. Gen File No 32371
CONCRETE PROPORTIONS
CLASS	CEMENT	SAND	STONE
A	1	2	4
B	1	3	6
D	1	4	7½
N.Y.C.&H.R.R.R.
Leased and Operated Lines
HARLEM DIVISION.
CULVERT EXTENSIONS.
TUCKAHOE TO HARTSDALE.
Scales Indicated
Oct 23, 1907
Issue No. 9
Revised 9-15-13.
OFFICE OF ENGINEER OF STRUCTURES.
Approved
Chief Engineer of Electric Zone Imps.
Engr of Structures
Engr of Co. Forces
Resident Engr
For Location
For R of W
By resolution adopted January 16th 1912 the Public Service Commission of the Second District of the State of New York formally approved the work performed by the New York Central & Hudson River Railroad Company at Tuckahoe, said work having been performed by order of the Commission in connection with the elimination of grade crossings at the above named place by the New York Central and Hudson River Railroad Company
SEQ 47749
32568