Westchester gov.com

George Latimer, Westchester County Executive

General Requirements and Proposals
Information for Bidders
General and Special Clauses
Technical Specifications

REHABILITATION OF WEAVER STREET PUMPING STATION
MAMARONECK VALLEY SANITARY SEWER DISTRICT
TOWN OF MAMARONECK, NEW YORK

Contract No. 22-526
Bid Opening: October 2, 2024

By Bidder (Please Print)	For Official Use Only
Firm/Business Name: _____	
Address: _____	_____
_____	_____

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

Division of Engineering

SPECIAL NOTICE

County of Westchester
New York

ADDENDA TO THE BID DOCUMENTS

Addenda to the Bid Documents will be published on the Empire State Purchasing Group website at (http://www.bidnetdirect.com/new-york) **It is the responsibility of each potential bidder to check the website on a regular basis for further information relative to the bid documents including information relating to any and all addenda** prior to submitting its bid. All Bidders are deemed to have reviewed and considered all addendums in their Bid.

SUBMISSION OF BIDS

Bidders should not submit the entire bid document with its bid submission. Instead, each bidder is required to submit the full set of designated Proposal Pages. The Proposal Pages are denoted by a border and are titled on the bottom as "Proposal Page ___". The Proposal Pages must be accompanied by the "Bid Bond and Consent of Surety" (as set forth in the Proposal Pages) attached to the outside of the sealed bid. A Bid Bond is NOT required for contracts of $100,000 or less. Failure to submit in this manner may cause the bid to be rejected.

The successful bidder will be required to furnish a Performance and Payment Bond.

SPECIAL NOTICE

County of Westchester
New York

MANDATORY PRE-BID SITE INSPECTION

A. Superseding the first paragraph of Article "3. PRE-BID SITE INSPECTION" of the Information for Bidders, Bidders are required to attend a Mandatory Pre-Bid Site Inspection at **10:00 a.m. Tuesday, September 10, 2024** at a meeting at the **Weaver Street Pumping Station, 84 Cargil Park Rd, Larchmont, NY 10538**, at which time they will examine the work site under escort by the County's representative.

BIDS FROM CONTRACTORS NOT IN ATTENDANCE AT THIS MEETING, OR THOSE WHO FAIL TO SIGN THE ATTENDANCE SHEET-WILL BE *REJECTED*

B. Bidders shall indicate their interest in the Mandatory Pre-Bid Site Inspection by contacting John Coelho, Department of Public Works and Transportation, Division of Engineering at (914) 995-5144.

C. All other portions of Article "3. PRE-BID SITE INSPECTION" of the Information for Bidders shall remain in full force and effect.

SPECIAL NOTICE

County of
Westchester New
York

MANDATORY OSHA CERTIFICATION

When a public works contract is in excess of $250,000.00, all employees are required to have successfully completed the OSHA 10 hours training class. All contractors and subcontractors must attach copies of proof of completion of the OSHA 10 hour course by all employees to the first certified payroll submitted to the County and on each succeeding payroll where any new or additional employee is first listed. Employees may be requested by the County's representative to verify compliance with the OSHA 10 hour course by showing their OSHA card.

When a public works contract is in excess of $1,000,000.00, all employees are required to have successfully completed the OSHA 30 hours training class. All contractors and subcontractors must attach copies of proof of completion of the OSHA 30 hour course by all employees to the first certified payroll submitted to the County and on each succeeding payroll where any new or additional employee is first listed. Employees may be requested by the County's representative to verify compliance with the OSHA 30 hour course by showing their OSHA card.

In addition, on any contract that includes excavation of underground facilities, the excavator is required to be certified and have completed the training and education program provided by the one-call notification system (Dig Safely New York, Inc. Certified Excavator Program in Safe Digging Best Practices) or any other provider authorized by the public service commission to administer such training and education program.

SPECIAL NOTICE

County of Westchester
New York

MINORITY PARTICIPATION POLICY

Contractors must comply with the County's Minority Participation Policy, including, but not limited to, the requirement that contractors make a demonstrated good faith effort to utilize Minority Owned Businesses ("MOB") and Women Owned Businesses ("WOB") (see IFB Article 36). To assist contractors in this effort the County has made available a list of MOB and WOB at http://mwbe.westchestergov.com/ Contractors are also encouraged to utilize other sources to identify potential MOB and WOB as subcontractors and suppliers.

All bidders must submit as part of their bid package the Minority/Women Owned Business Enterprise Questionnaire located in the Proposal Page section of the bid documents.

SPECIAL NOTICE

County of Westchester
New York

CHANGES IN THE WICKS LAW

Effective July 1, 2008, construction contracts of one million five hundred thousand dollars or less will not require the preparation of separate contracts for plumbing and gas fitting; steam heating, hot water heating, ventilation and air conditioning apparatus; and electric wiring and standard illuminating fixtures and general construction.

Each bidder on a public work contract, where the preparation of separate contracts is not required shall, to the full extent applicable, submit with its bid a separate sealed list that names each Subcontractor that the bidder will use to perform work on the contract and the agreed upon price to be paid to each for (a) plumbing and gas fitting, (b) steam heating, hot water heating, ventilating and air conditioning apparatus and (c) electric wiring and standard illuminating fixtures and (d) general construction. The submission (Proposal Page 6) that contains the agreed upon price shall be acknowledged by both Contractor and Subcontractor. For purposes of this paragraph, the acknowledgment from the Subcontractor may contain the facsimile signature of an officer of the Subcontractor.

After the low bid is announced, the sealed list of subcontractors submitted with the bid shall be opened and the names of such subcontractors shall be announced. Thereafter, any changes of subcontractors or agreed-upon amount to be paid to each shall require the approval of the County upon a showing of legitimate construction need for such change.

The Successful low bidder, before award of the contract, must procure and provide to the County, from each of the above denoted Subcontractors, a Contract Disclosure Statement and the Required Disclosure of Relationships to County forms.

The sealed lists of Subcontractors submitted by unsuccessful bidders shall be destroyed after the contract award.

THIS PROJECT IS NOT SUBJECT TO THE REQUIREMENTS OF THE "WICKS LAW". ACCORDINGLY, EACH BIDDER IS REQUIRED TO SUBMIT SPECIFIC INFORMATION PERTAINING TO ITS PROPOSED SUBCONTRACTORS. PLEASE SEE THE "NOTICE TO CONTRACTORS" THAT FORMS A PART OF THESE BID DOCUMENTS.

SPECIAL NOTICE

County of Westchester
New York

COMPLETION OF GRANT FUNDING FORMS

The bidders are hereby notified that if this project, or any portion thereof, is funded by a grant then the contractor will be responsible to complete all appropriate forms as required by the grant agency in order to complete the application.

PROMPT EXECUTION AND RETURN OF CONTRACT

A. The successful bidder is required to return the completed contract to the County within ten (10) days of receipt of the execution copy of the contract. The contract must be signed, notarized and returned to the County with all insurance certificates, bonds and supporting documentation, including all required Subcontractor information.

B. The County reserves all of its rights, including, but not limited to, proceeding against the bid bond, if the successful bidder fails to submit the complete executed package within the above time frame.

SPECIAL NOTICE

County of Westchester
New York

PROOF OF PAYMENT BY CONTRACTOR TO SUBCONTRACTORS AND MATERIALMEN.

In addition to and without limiting any of the provisions set forth in Section 23 of the Information for Bidders, after the Contractor completes 50% of the work under the contract, the Contractor may be required to supplement each requisition submitted to the County with documentation that establishes that the Contractor has timely and properly paid its subcontractors and materialmen as required by Section 23 of the Information For Bidders. Such documentation may include copies of both sides of cancelled check(s) paid to the order of the subcontractors and materialmen and such other documentation as may be reasonably requested by the Commissioner. If the Contractor fails to submit such documentation, the Commissioner may, in his sole discretion, withhold payment of the requisition until such time as the documentation is properly submitted. Nothing herein is intended or shall be construed to confer upon or give any subcontractor or materialman, or its successors and assigns, any third party beneficiary rights, remedies or basis for reliance upon, under or by reason of the contract or this Special Notice provision.

SPECIAL NOTICE

County of Westchester
New York

BUILDERS RISK INSURANCE

In addition to the insurance requirements listed in Section 2 of the Information for Bidders, the Contractor, at their own cost and expense, shall provide and maintain a **Builder's Risk Form, All Risk Insurance Contract.** The coverage shall be written for **100% of the completed value,** with the County of Westchester named as loss payee as its interest may appear. In formulating its proposal, the Contractor shall include the costs for this coverage. In the event that claims, for which the County may be liable, in excess of the insured amounts provided herein are filed by reason of Contractor's negligent acts or omissions under the Agreement or by virtue of the provisions of the labor law or other statute or any other reason, the amount of excess of such claims or any portion thereof, may be withheld from payment due or to become due the Contractor until such time as the Contractor shall furnish such additional security covering such claims in form satisfactory to the County of Westchester.

SPECIAL NOTICE

County of Westchester
New York

PREVAILING WAGE

All public works contracts are subject to the payment of the prevailing wage and supplements as set forth by the laws of the State of New York, including, but not limited to, Articles 8 and 9 of the New York Labor Law (the "Prevailing Wage Laws"). Westchester County has an active Prevailing Wage Enforcement Officer who enforces the Prevailing Wage Laws within the County for public works contracts, including reviewing certified payroll records, visiting job sites, interviewing the employer and employees (See IFB Article 12) and, if necessary, requesting copies of cancelled checks.

Any Contractor who fails to comply with the Prevailing Wage Laws, including, but not limited to, failing to pay the prevailing wage rates and supplements, failing to submit certified payroll records to the County or failing to post the prevailing wage rates and supplements at the work site, will be subject to enforcement as provided for in the Contract and laws of the State of New York through the Westchester County District Attorney's office, the Commissioner of the New York State Department of Labor, the County and/or the employee who suffered the underpayment. This enforcement could include, but is not limited to, criminal penalties, civil penalties, debarment from future bid awards, the withholding of payment under the Contract to satisfy the unpaid wages and supplements, including interest and civil penalty. In addition, such a failure shall constitute grounds for cancellation of the Contract (IFB 8(C)). Moreover, a prime contractor is responsible for its subcontractor's failure to comply with, or evasion of, the provisions of the Prevailing Wage Laws.

SPECIAL NOTICE

County of Westchester
New York

PROJECT LABOR AGREEMENT (PLA)

A. The County of Westchester has determined that a Project Labor Agreement will be used on this Project. The successful bidder will be required as a condition of this Contract to execute the PLA with the Building and Construction Trades Council of Westchester and Putnam Counties, New York, AFL-CIO ("Council"). The PLA will be substantially in the same form as the PLA included in this contract specification book. Bidders are urged to familiarize themselves with the terms and conditions of the PLA.

B. It should be noted that Schedule A of the PLA contains a list of the local unions affiliated with the Council. Copies of the applicable Collective Bargaining Agreements of the local unions can be obtained by writing to the Building and Construction Trades Council of Westchester and Putnam Counties, New York, AFL-CIO at 258 Saw Mill River Road, Elmsford, New York 10523, Attn.: Carol A. Boccardi.

CONTRACTOR SPECIAL NOTICE

Department of Environmental Facilities
Environmental Management System Requirements

General

The Contractor is responsible for complying and ensuring that all the Contractor's subcontractors comply with all federal, state, and local environmental and health and safety legal requirements.

The Contractor recognizes that the Department of Environmental Facilities (DEF) has an Environmental Management System (EnvMS) that includes DEF's Wastewater Treatment Plants (WWTPs), Solid Waste facilities, water treatment facilities, and related facilities and shall conform to and ensure the conformance of all of the Contractor's subcontractors (subcontractors) to the DEF Environmental Policy (Policy), all EnvMS associated procedures and protocols, and the requirements of this Special Notice. This includes the requirement to participate in the corrective action process, including attendance at meetings should activities in which the Contractor is involved result in a deviation from the Policy or the requirements of the EnvMS. Depending on the seriousness of the deviation, this may include participation in full root cause analysis.

Training

Prior to performing work the project superintendent, project manager and all responsible foremen for the Contractor and subcontractors shall attend a required 45-minute training session on EnvMS requirements provided by DEF Personnel. The Contractor shall ensure the attendance of these staff. The training may occur at the facility or at another location. The Contractor shall ensure that a minimum of one person who has participated in the EnvMS training is available on-site at all times that the Contractor's personnel or subcontractors are on-site.

The Contractor shall ensure that all employees and subcontractor employees working at any DEF facility are trained on the requirements of the EnvMS relevant to their work and shall keep records of training on site. The initial training for superintendents, project managers and foremen may be video taped by the Contractor for subsequent training of all Contractor's employees and subcontractor employees.

Records of training shall be kept by the contractor and made available to DEF, upon request.

Competency

The Contractor shall ensure employees and subcontractors are capable, based on training, education, licensing, and/or experience, to perform tasks that can impact the

environment. The Contractor shall maintain records of competency and make these records available to DEF upon request.

Project Coordination

The Contractor shall designate a staff member who will be responsible for the oversight of EnvMS project requirements and to work as a liaison with the plant Superintendent or facility operator. This person, or their properly qualified designee, must be available anytime the Contractor's personnel or subcontractors are on-site performing work.

Working Environment

In addition to the hazards typically found on construction and industrial sites, the following specific hazards are present at the WWTPs and water treatment facilities.

Hazards	Yonkers	Port Chester	Peekskill	Ossining	New Rochelle	Mamaroneck	Blind Brook	Shaft 22	Kensico Dam	Gate of Heaven
Digester Gas (consists mostly of methane – the primary component of natural gas)	X		X							
Natural Gas	X	X		X	X					
Propane		X	X		X					
Oxygen					X					
Class 1, Division 1 Explosion Proof Areas	X	X	X	X	X	X	X			
Confined Spaces	X	X	X	X	X	X	X			
Chemical Storage/Hazardous Materials	X	X	X	X	X	X	X	X	X	X
Hydrogen Sulfide	X	X	X	X	X	X	X			
High Pressure Lines	X	X	X	X	X	X	X			
Open Tanks / Drowning Hazards	X	X	X	X	X	X	X			
Ladders, Platforms & Slippery Surfaces	X	X	X	X	X	X	X	X	X	X
High Voltage Electrical Systems	X	X	X	X	X	X	X			
Potential Exposure to Blood Borne Pathogens	X	X	X	X	X	X	X			
Automatic Equipment	X	X	X	X	X	X	X			
Chlorine Gas								X		

Other DEF facilities (transfer stations, pump stations) may have these same or similar hazards.

The Contractor and subcontractors shall plan work appropriately for this environment and the specific location(s) where work is anticipated and implement the necessary health and safety precautions including, but not limited to, the use of proper equipment, including non-sparking tools, proper personal protective equipment (PPE) and monitoring equipment, and compliance with contractor Confined Space Entry and Lock-out / Tag-out programs.

Health and Safety Plan

The contractor shall develop a health and safety plan (plan) specific to the facility and the work planned and shall ensure that all work is performed in conformance with the plan. The contractor shall ensure that the plan addresses all relevant hazards including, but not limited to, the aforementioned hazards. The plan must be kept on site at the facility when work is being performed and must be made available to DEF personnel upon request.

Health and Safety Compliance Monitoring

An expert provided by the Contractor will monitor the Contractor and subcontractor compliance with all applicable health and safety regulations and the health and safety plan on an ongoing basis while the Contractor and subcontractors are performing work at any DEF facility. Monitoring shall be performed in accordance with the health and safety requirements in the project specifications. The Contractor shall ensure that all employees and subcontractors cooperate with the expert. The expert will document results of the monitoring and provide the results to the Contractor on an ongoing basis. The Contractor shall correct all health and safety non-compliances identified by the independent expert in a timely fashion. The monitoring results and any corrective actions taken shall be provided to DEF's representative on site.

Plant Equipment and Control of Hazardous Energy

All DEF sites are working facilities that must function at all times so as to meet regulatory obligations. The Contractor shall receive prior authorization from the WWTP Superintendent, the Supervisor of Operations, Chief Operator (water districts) facility manager (solid waste) if any planned activities of the Contractor or Contractor's subcontractor could interfere with the operation of the DEF facility, involve the use of plant or facility equipment, or require taking plant or facility equipment on or off line. The contractor shall not proceed without expressed authorization by same. DEF reserves the right to rescind authorization for the Contractor to use, work on, or otherwise render inoperable, any piece of equipment if needed for the operation of the plant or facility.

The Contractor shall be responsible for ensuring control of hazardous energy (lock-out/tag-out) for all contractor and subcontractor activities. Contractor shall coordinate taking plant equipment off line and putting it back on line with the Plant Superintendent or the Supervisor of Operations, Chief Operator (water districts) or facility manager (solid waste). Only authorized DEF personnel shall take plant equipment off line or place it back on line. Plant equipment includes, but is not limited to, all gates, valves, pumps, electrical panels, solid waste facilities, water and wastewater treatment, and associated equipment.

Odor Notification

The Contractor shall notify the WWTP Superintendent, Supervisor of Operations, Chief Operator (water districts) facility manager (solid waste) or ISO Coordinator 24 hrs prior to the initiation of activities that have the potential to cause odors in excess of those associated with normal operations.

Odor Control

The Contractor and subcontractors shall comply with all EnvMS odor control requirements. WWTP doors must be kept closed at all times except for entry or exit of personnel and equipment. Open periods shall be minimized to the greatest extent possible. Doors shall not be propped open or held open without the expressed approval of the WWTP Superintendent or the Supervisor of Operations.

For activities with the potential to cause odors in excess of those associated with normal operations, the contractor shall plan and implement appropriate odor abatement controls.

Demolition

Contractor shall implement a methodology to tag or mark all equipment and piping prior to demolition. All contractor and subcontractor employees responsible for demolition activities shall be trained on the methodology. Prior to demolition, marked or tagged equipment scheduled for demolition shall be reviewed with DEF's representative on site.

Stormwater Management, Soil Erosion and Sediment Control Activities

The Contractor shall comply strictly with all Soil Erosion and Sediment Control project specifications; stormwater permit requirements, if a permit is required; and regulatory requirements including the ***New York Standards and Specifications for Erosion and Sediment Control and the County of Westchester Best Management Practices for Reducing Nitrogen and Other Stormwater Pollutants***.

Soil Erosion and Sediment Controls shall include, but are not limited to, the following:

- Proper installation and use of erosion and sediment capture devices, i.e. silt fences and hay bales
- Protection of storm drain inlets
- Proper and timely backfilling and stabilization of trench excavation
- Inspections of discharge points
- Proper maintenance of erosion and sediment capture devices
- Regular inspections of controls by qualified Contractor staff
- Use of phosphorus containing fertilizers only in conformance with County requirements.

The Contractor shall be subject to Erosion and Sediment Control Inspections by DEF personnel.

Spills Prevention, Control and Response Procedures

Contractor and subcontractors shall have written spill response procedures that conform to DEF requirements. The Contractor's and subcontractors' supervisory personnel will be trained in the facility's Spill Prevention, Control and Response Procedures Requirements during the 45-minute EnvMS training session. Contractors and subcontractors shall ensure that these requirements are complied with and that their on-site employees are properly trained in spill prevention, control and response, and conformance with their spill response procedures. Contractor and subcontractors shall have a copy of these procedures available on site. The Contractor shall have appropriate spill clean-up equipment on site at all times.

In the event of a spill, the Contractor and subcontractors shall immediately respond to the spill in conformance with their spill procedures and as soon as possible report the spill to the main office.

The Contractor is responsible for proper clean-up and disposal of waste materials generated by any spill resulting from their activities.

Vehicle and Equipment Control

The Contractor and subcontractors shall ensure all vehicles and equipment are properly maintained and free of leaks. Contractor and subcontractors shall not perform fueling or maintenance of vehicles and equipment onsite without the expressed approval of the WWTP Superintendent or Supervisor of Operations, Chief Operator (water districts), or facility manager (solid waste). Contractor and subcontractors shall ensure vehicles comply with Westchester County idling restrictions and do not idle unnecessarily. The Contractor and subcontractors shall ensure all fuel used is ultra low sulfur in content.

Good Housekeeping/Chemicals, Petroleum and Hazardous Materials Management

The Contractor and subcontractors shall demonstrate good housekeeping practices and perform daily site clean-ups at the work site. The work site shall be subject to inspections by DEF Personnel.

The Contractor and subcontractors shall properly store and use all petroleum, chemicals and hazardous materials. This shall include but is not limited to use of proper secondary containment and protection from precipitation. Storage locations shall be pre-approved by the WWTP Superintendent, Supervisor of Operations, Chief Operator (water districts) or facility manager (solid waste) or ISO Coordinator.

The Contractor shall provide all Material Safety Data Sheets (MSDS) for all petroleum, chemicals and hazardous materials used at the work site to DEF prior to bringing same on site and shall maintain all MSDS on site. DEF reserves the right to forbid any material from being brought on site.

At the completion of work, the Contractor shall remove any staged materials, petroleum, chemicals, and hazardous materials remaining from the project, whether a result of contractor or subcontractor activities. Staged materials, petroleum, chemicals, and hazardous materials may remain with the expressed written approval of the WWTP Superintendent or Supervisor of Operations, Chief operator (water districts) facility manager (solid waste).

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Waste Management and Minimization

The Contractor and subcontractors shall dispose of waste in a manner that meets all applicable laws and regulations including Westchester County Source Separation Law (Chapter 825). Contractors shall make every effort to minimize waste production during construction operations. Contractors and subcontractors shall not bring waste onsite and may not dispose of waste onsite or in DEF receptacles without the expressed approval of DEF

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Mercury Containing Devices

The Contractor shall ensure no mercury containing devices are installed. Any mercury devices removed by the Contractor or subcontractors shall be disposed of legally by the Contractor and records of disposal shall be provided to the facility.

Energy Efficiency and Environmentally Preferable Products

With the exception of exterior lighting and historic lighting at the South Yonkers CSO and the Mamaroneck WWTP, the Contractor shall ensure incandescent bulbs are not installed or used.

The contractor shall:

- select energy star equipment or equipment within the upper 25 percent of energy efficiency as designated by the United States Federal Energy Management Program
- select environmentally preferable products
- utilize environmentally preferable cleaning products

if the prices of the equipment and products are reasonably competitive and the quality is adequate for the purpose intended.

The contractor shall ensure Styrofoam products are not utilized and shall request non-Styrofoam packaging for equipment and products.

Landscaping

When selecting plantings, the Contractor shall ensure plantings native to Westchester County are utilized. If no native species are appropriate, the Contractor shall ensure the planting of noninvasive species.

Pesticide Ban

The Contractor shall ensure pesticides that are banned under Westchester County Law (Chapter 690) are not utilized at the work site.

Change to Environmental Project Design Specification

The Contractor shall receive approval from an authorized County representative prior to making any modifications that affect environmental project specifications due to field conditions.

Third Party Audit

The EnvMS is certified to ISO 14001. The certification requires that a yearly third party audit be performed. The Contractor shall ensure that all employees cooperate with the third party auditor, answer questions put to them by the auditor, and make records required as part of this special notice available to the auditor, as requested.

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WESTCHESTER COUNTY
DEPARTMENT OF ENVIRONMENTAL FACILITIES

ENVIRONMENTAL POLICY

It is the mission of the Westchester County Department of Environmental Facilities to protect, preserve and conserve the water supply and quality of watercourses within or on the borders of Westchester County; to provide proper solid waste stream reduction and recycling; and to protect the health, safety and welfare of the public. The Department is responsible for planning, operating and maintaining: water resource recovery facilities, sanitary collection systems, drinking water treatment and distribution facilities, and solid waste facilities in compliance with local, state and federal laws.

To achieve this mission and thereby contribute to a more sustainable society, DEF is committed to:

- meet, and where practical, exceed its environmental legal and regulatory requirements, and other commitments;
- prevent pollution, protect the environment; and,
- continually improve.

Vincent F. Kopicki, P.E.
Commissioner, DEF

Effective Date: 3-13-2018

NOTICE TO CONTRACTORS

County of Westchester
New York

Sealed proposals for the following construction work:

CONTRACT NO: **22-526**

ADVERTISING: **August 30, 2024**

MANDATORY PRE-BID INSPECTION: **September 10, 2024**

Rehabilitation Of Weaver Street Pumping Station
Mamaroneck Valley Sanitary Sewer District
Town of Mamaroneck, New York

will be received by the Board of Acquisition and Contract in Room 528, Michaelian Office Building, 148 Martine Ave., White Plains, New York until 11:00 a.m., **Wednesday, October 2, 2024**, and immediately thereafter, the bids will be publicly opened and read aloud in Room 527 of the said building. The bid opening also will be made accessible to the public via the livestreaming service WebEx. The livestreaming of the bid opening via WebEx is in addition to and not in place of the publicly bid opening to be held in Room 527 of the Michaelian Office Building. For additional bidding information or questions call (914) 995-2274.

Instructions for livestreaming via WebEx. Attendees may join by computer browser at https://westchestergov.webex.com/meet/bac-bidopening or by phone 1-415-655-0001 US Toll or 1-844-621-3956 US Toll Free. The Access Code is 614 981 028.

The Bid Documents **(**General Requirements, Information for Bidders, Technical Specifications, etc. with Authorized Proposal Pages) **MUST BE OBTAINED from the Empire State Purchasing Group website at the following web address:** http://www.bidnetdirect.com/new-york.
There is no cost to the bidder for this service. Bid documents will be available after 1:00 p.m. on the advertising date.

PLEASE TAKE NOTICE: IN ORDER TO SUBMIT A BID, BIDDERS MUST REGISTER AND DOWNLOAD THE BID DOCUMENTS FROM THE EMPIRE STATE PURCHASING GROUP WEBSITE AND MUST REGISTER USING THE NAME OF THE PERSON OR BUSINESS ENTITY THAT WILL BE SUBMITTING THE BID. IN ORDER TO ENSURE THAT COUNTY BID DOCUMENTS HAVE NOT BEEN ALTERED IN ANY WAY, THE COUNTY WILL NOT ACCEPT BIDS FROM PERSONS OR BUSINESS ENTITIES THAT HAVE NOT FOLLOWED THIS REQUIREMENT.

The Bid Documents include Contract Drawings which **MAY BE OBTAINED at no cost on the Empire State Purchasing Group website at the following web address:** http://www.bidnetdirect.com/new-york**,** after 1:00 p.m. on the advertising date.

If the bidder is unable to utilize the electronic version of the Contract Drawings that are available on the Empire State Purchasing Group Website, the bidder may purchase copies of the Contract Drawings. Contract Drawings may be obtained from the Office of the Board of Acquisition and Contract at the above address after 1:00 p.m. on the advertising date and between the hours of 9:00 a.m. to 4:00 p.m. Monday thru Friday. Copies of the Contract Drawings shall be made available upon payment of a personal check, company check or money order made payable to the County of Westchester, in the amount of **$100.00** per set. For bidders, the deposit for each set of drawings will be refunded in full if returned in good condition within thirty days after award or rejection of bids. For non-bidders, only fifty percent of the deposit will be refunded. No refunds will be made to the successful bidder.

Each bidder is required to submit the full set of authorized Proposal Pages and all bids over **$100,000.00** must also be accompanied by the "Bid Bond and Consent of Surety" (as set forth in the Proposal Pages) attached to the outside of the sealed bid. Failure to submit in this manner may cause the bid to be rejected. **The successful bidder, no matter the amount of its bid, will be required to furnish a Performance and Payment Bond with its signed contract.**

To the full extent applicable, each bidder shall submit with its bid a separate sealed list that names each Subcontractor that the bidder will use to perform work on the contract and the agreed upon price to be paid to each for: (a) plumbing and gas fitting, (b) steam heating, hot water heating, ventilating and air conditioning apparatus and (c) electric wiring and standard illuminating fixtures and (d) general construction. The submission (Proposal Page 41) that contains the agreed upon price shall be acknowledged by both Contractor and Subcontractor. For purposes of this paragraph, the acknowledgment from the Subcontractor may contain the facsimile signature of an officer of the Subcontractor.

The Successful low bidder, before award of the contract, must obtain and provide to the County, from each of the above denoted Subcontractors, fully completed and signed Contract Disclosure Statement (Proposal Pages 24-32) and Required Disclosure of Relationships to County (Proposal Pages 33) forms.

The sealed lists of Subcontractors submitted by unsuccessful bidders shall be destroyed, unless you request that it be returned by checking the applicable box on Proposal Page 5.

The County of Westchester reserves the right to waive any informalities in the bids, or to reject any or all bids. No bidder may withdraw its bid within forty-five (45) days after the date of the bid opening.

Pursuant to Chapter 308 of the Laws of the County of Westchester, it is the goal of the County to use its best efforts to encourage, promote, and increase the participation of business enterprises owned and controlled by persons of color or women - Minority Business Enterprise (MBE) and Women Business Enterprise (WBE).

REMINDER: All required licenses should be submitted with the Bid.

COUNTY OF WESTCHESTER, NEW YORK
DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

BY: Hugh J. Greechan, Jr., P.E., Commissioner

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Exhibit A Hazardous Materials Inventory Report for the Fenimore Road, Weaver Street, Archville, and Country Club Lane Pumping Stations

1. GENERAL REQUIREMENTS AND PROPOSALS

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

Division of Engineering

1. DESCRIPTION OF THE WORK

Work under this Contract includes all necessary labor, materials and equipment required to:

The Work involves the rehabilitation of the Weaver Street Pumping Station owned and operated by the Westchester County Department of Environmental Facilities (WCDEF) located in the Town of Mamaroneck, New York. The Weaver Street Pumping Station serves a portion of the Mamaroneck Valley Sanitary Sewer District. Work to be performed under this Contract includes, but is not limited to, the replacement of all mechanical, heating and ventilating, plumbing, electrical, and instrumentation systems at the existing station and the site/civil, architectural, and structural improvements to construct an elevated slab and Electrical Building to provide future resiliency from overland flooding.

It is not intended that this description of work mention each particular item required, but that it give information concerning the general scope and areas of work for the convenience of the bidders.

THIS PROJECT IS NOT SUBJECT TO THE REQUIREMENTS OF THE "WICKS LAW". ACCORDINGLY, EACH BIDDER IS REQUIRED TO SUBMIT SPECIFIC INFORMATION PERTAINING TO ITS PROPOSED SUBCONTRACTORS. PLEASE SEE THE "NOTICE TO CONTRACTORS" THAT FORMS A PART OF THESE BID DOCUMENTS.

2. SUBCONTRACTING & DIRECT EMPLOYMENT OF LABOR

The Contractor shall not subcontract more than ninety (90%) percent of its bid. The Contractor must directly employ at least ten (10%) percent of the personnel working on this contract as measured in man-days worked.

"Directly employ" shall be construed to include only workers employed and paid directly by the Contractor, usually for wages or salary.

The Contractor expressly acknowledges that any violation of this provision constitutes a default under this contract.

3. REQUIRED TIME FOR COMPLETION OF THE WORK

Notification to commence the work will require the mandatory submission of all the executed contracts and the Certificates of Insurance after receipt of authority to award.

The Contractor shall commence the work embraced in this contract within ten (10) days of the service of Notice by the County to do so and shall complete the said work within **560** consecutive calendar days computed from the date of such Notice to commence.

4. SECURITY REGULATIONS

Security Regulations For all County Facilities except County Correctional Facilities:

A. Contractor's attention is called to the fact that this work is to be performed on property which is the responsibility of the County; therefore, all personnel associated with this contract are subject to special conditions affecting security and control of the facilities operations. Every person required to enter the work site will be issued an ID card and be required to fill out appropriate applications. **There is a $30.00 processing fee for each lost ID card**; remitted by check made payable to the County of Westchester. All ID processing will be scheduled by the Construction Administrator.

B. The Contractor/Subcontractor shall issue a copy of the security regulations (Paragraph C) to all personnel engaged on this project.

C. All Contractor/Subcontractor personnel shall be bound by the following security regulations for the duration of this contract.

1) All personnel must conspicuously display the ID card and identify themselves upon request.

2) If an ID card is misplaced or lost, report this immediately to the Inspector.

3) All Contractor/Subcontractor personnel are responsible for all tools and equipment and you must report any loss immediately to the Construction Administrator.

4) All personnel must observe all orders of the Owner.

5) All personnel are to report any unusual incidents or problems to the Construction Administrator immediately.

6) All personnel shall not possess or consume any alcoholic beverage or illegal drug or medication while on the property, or report to work under the influence of alcohol or drugs.

7) Any vehicle left on the property must be locked and the ignition keys must be removed. Vehicles will not be left overnight without prior approval.

8) All personnel shall not enter any other areas of the premises (except the areas agreed to) without prior approval of the Construction Administrator.

Security Regulations For County Correctional Facilities:

A. Contractor's attention is called to the fact that this work is to be performed on property adjacent and/or within the County's Correctional Facilities; therefore, all personnel associated with this project are subject to special conditions affecting security and control of the Correctional Facility Operations. Every person required to enter the work site will be fingerprinted, processed for a photo ID card and be required to fill out appropriate applications. **There is a $100.00 processing fee for each person**, checks made payable to the Commissioner of Finance. All ID processing will be scheduled by the Construction Administrator.

B. All Contractors and Subcontractors shall issue a copy of the security regulations (Paragraph C) to all personnel to be engaged on this project.

C. All Contractor's and Subcontractor's personnel shall be bound by the following security regulations for the duration of this project.

1) All personnel entering the Penitentiary, Jail or Women's Unit must stop and identify themselves to the Control or Desk Officer who will issue the appropriate pass after ascertaining that they have been cleared to enter the facility. Only workers with valid ID will be permitted entry. **NO HELPERS**.

2) All personnel must sign in the Visitor's Book, to include the following information: **PERSON'S NAME, COMPANY NAME, REASON FOR ENTRY, WORK LOCATION IN BUILDING**.

3) All personnel must conspicuously display the ID card and identify themselves upon request.

4) If ID card is misplaced or lost, report this loss immediately to the Shift Captain or Associate Warden.

5) All tradesmen will be required to perform a tool inventory inspection of all tools in their possession to demonstrate to the admitting Correction Officer that the typed inventory list matches the tools each time they enter and leave the building. The tradesmen are responsible for keeping all tools and equipment locked when not in immediate use and they must report any loss of tools or equipment immediately to the Shift Captain or Associate Warden.

6) All tradesmen and helpers shall carry all tools in a locked and secured tool box or tool cart. A typed inventory sheet shall be carried with the tool box/cart listing all hand and power tools. A manufacturer’s MSD Sheet shall be carried with the tool box/cart for any chemical compound that the tradesman has in his/her possession.

7) All debris (i.e. packaging, demolition, etc) shall be removed from the worksite at the end of each workday.

8) All personnel are subject to search at all times.

9) All personnel must observe all orders of Correctional Staff.

10) All personnel are to report any unusual incidents or problems to a Correction Officer, Shift Captain or the Associate Warden immediately.

11) All personnel shall not possess or consume any alcoholic beverage or illegal drug or medication while on County property, or report to work under the influence of alcohol or drugs.

12) Any vehicle left on County property must be locked and the ignition keys must be removed. Vehicles will not be left over-night on County property without prior approval.

13) All personnel shall not enter any other areas of the prison (except the areas agreed to) without prior approval of the Shift Captain or the Associate Warden.

14) All personnel shall not bring anything in for any inmate/detainee or staff member or take out anything for any inmate/detainee or staff member.

15) All personnel shall not engage in any unnecessary conversations with any inmate/detainee.

16) Weapons, i.e., guns, knives, blackjacks, to include any tool activated by gunpowder or other explosive charge is prohibited in the building (i.e., stud gun). Violators of this rule are subject to arrest.

17) All personnel must sign out when leaving and must return the ID card to the Control/Desk Officer before leaving.

18) Failure of the contractor to follow these procedures will result in the contractor being denied access to the facility.

5. PAYMENT FOR BONDS AND INSURANCE

The amount bid for contract bonds and insurance shall not exceed 3% of the total contract price excluding the bid price for Miscellaneous Additional Work (Item W800) and Field Testing Equipment (W851), where applicable. Should the bidder exceed the foregoing three percent (3%), the Department will make the necessary adjustment to determine the total amount bid based on the arithmetically correct proposal.

The amount bid shall be payable with the first contract payment.

GENERAL REQUIREMENTS

CONTRACT DRAWINGS:

CONTRACT NUMBER 00-000

The Design Drawings, as listed on the Contract Drawing Index, herewith made a part of these Specifications, shows in general and/or in detail the work to be done under this Contract and/or the various Contracts forming the entire work for the Project, as described herein.

After sending the executed contract to the County and prior to the first job meeting, the Contractor is responsible for obtaining from Public Works, Division of Engineering, Michaelian Office Building, White Plains, a maximum of five gratis copies of the Contract Drawings and Specifications; for the Contractor's permanent possession. Additional sets, requested by the Contractor, beyond the permitted number and time limit, will be furnished by Public Works; but at the Contractor's expense.

DRAWING NO.	TITLE	SHEET NO.
205-03-T-42-0	COVER SHEET	G-001
205-03-G-43-0	DRAWING INDEX	G-002
205-03-G-44-0	GENERAL NOTES, ABBREVIATIONS, SYMBOLS AND LEGEND	G-003
205-03-G-45-0	OVERALL SITE PLAN AND CONTRACTOR'S STAGING AREA	G-004
205-03-E-46-0	INSTRUMENTATION SYMBOLS & LEGEND	I-001
205-03-E-47-0	NETWORK ARCHITECTURE	I-002
205-03-E-48-0	P&ID SHEET 1	I-003
205-03-E-49-0	P&ID SHEET 2	I-004
205-03-E-50-0	PANEL LAYOUT - SHEET 1	I-005
205-03-E-51-0	PANEL LAYOUT - SHEET 2	I-006
205-03-E-52-0	PANEL LAYOUT - SHEET 3	I-007
205-03-E-53-0	INSTALLATION AND MOUNTING DETAILS - SHEET 1	I-008
205-03-E-54-0	INSTALLATION AND MOUNTING DETAILS - SHEET 2	I-009
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205-03-E-56-0	INSTALLATION AND MOUNTING DETAILS - SHEET 4	I-011
205-03-G-57-0	GENERAL NOTES, LEGENDS, SYMBOLS AND ABBREVIATIONS	C-001
205-03-G-58-0	EROSION CONTROL - SITE PLAN	C-002
205-03-G-59-0	DEMOLITION - SURFACE FEATURES - SITE PLAN	C-003
205-03-G-60-0	DEMOLITION - BURIED PIPING AND UTILITIES - SITE PLAN	C-004
205-03-G-61-0	SURFACE FEATURES - SITE PLAN	C-005
205-03-G-62-0	BURIED PIPING AND UTILITIES - SITE PLAN	C-006

DRAWING NO.	TITLE	SHEET NO.
205-03-G-63-0	TYPICAL DETAILS - SHEET 1	C-007
205-03-G-64-0	TYPICAL DETAILS - SHEET 2	C-008
205-03-S-65-0	GENERAL NOTES AND ABBREVIATIONS	S-001
205-03-S-66-0	SPECIAL INSPECTIONS	S-002
205-03-S-67-0	DEMOLITION PLANS AND SECTIONS	S-003
205-03-S-68-0	PLANS - SHEET 1	S-004
205-03-S-69-0	PLANS - SHEET 2	S-005
205-03-S-70-0	SECTIONS - SHEET 1	S-006
205-03-S-71-0	SECTIONS AND DETAILS - SHEET 2	S-007
205-03-S-72-0	CONCRETE REPAIR DETAILS	S-008
205-03-S-73-0	TYPICAL DETAILS - SHEET 1	S-009
205-03-S-74-0	TYPICAL DETAILS - SHEET 2	S-010
205-03-A-75-0	ARCHITECTURAL LEGENDS, ABBREVIATIONS AND GENERAL NOTES	A-001
205-03-A-76-0	CODE NOTES AND PLANS	A-002
205-03-A-77-0	LIFE SAFETY PLANS	A-003
205-03-A-78-0	ELECTRICAL BUILDING PLANS AND ELEVATIONS	A-004
205-03-A-79-0	ELECTRICAL BUILDING AND WALL SECTIONS	A-005
205-03-A-80-0	WET WELL/DRY WELL PLANS	A-006
205-03-A-81-0	WET WELL/DRY WELL SECTIONS	A-007
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205-03-M-87-0	UPPER LEVEL - DEMOLITION PLAN	M-003
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205-03-M-90-0	LOWER LEVEL - DEMOLITION PLAN	M-006
205-03-M-91-0	DEMOLITION SECTIONS - SHEET 1	M-007
205-03-M-92-0	DEMOLITION SECTIONS - SHEET 2	M-008
205-03-M-93-0	TOP OF STRUCTURE - PLAN	M-009
205-03-M-94-0	UPPER LEVEL - PARTIAL PLAN AT EL. 14.20	M-010
205-03-M-95-0	UPPER LEVEL - PLAN AT EL. 4.48	M-011
205-03-M-96-0	INTERMEDIATE LEVEL - PLAN AT EL. -6.50	M-012
205-03-M-97-0	INTERMEDIATE LEVEL - PLAN AT EL. -7.90	M-013
205-03-M-98-0	LOWER LEVEL - PLAN AT EL. -15.62	M-014
205-03-M-99-0	LOWER LEVEL - PLAN AT EL. -17.65	M-015
205-03-M-100-0	SECTIONS - SHEET 1	M-016

DRAWING NO.	TITLE	SHEET NO.
205-03-M-101-0	SECTIONS - SHEET 2	M-017
205-03-M-102-0	SECTIONS - SHEET 3	M-018
205-03-M-103-0	SECTIONS - SHEET 4	M-019
205-03-M-104-0	SECTIONS - SHEET 5	M-020
205-03-M-105-0	TYPICAL DETAILS – SHEET 1	M-021
205-03-M-106-0	TYPICAL DETAILS – SHEET 2	M-022
205-03-H-107-0	GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS	H-001
205-03-H-108-0	DEMOLITION PLANS – SHEET 1	H-002
205-03-H-109-0	DEMOLITION PLANS – SHEET 2	H-003
205-03-H-110-0	DEMOLITION - SECTIONS	H-004
205-03-H-111-0	LOWER, INTERMEDIATE, AND UPPER LEVEL - PLANS	H-005
205-03-H-112-0	TOP OF STRUCTURE AND UNDERSIDE - PLANS	H-006
205-03-H-113-0	SECTIONS	H-007
205-03-H-114-0	SCHEDULES AND DETAILS	H-008
205-03-H-115-0	DETAILS	H-009
205-03-P-116-0	PLUMBING GENERAL NOTES, ABBREVIATIONS, LEGEND, AND SYMBOLS	P-001
205-03-P-117-0	GRADE LEVEL - DEMOLITION PARTIAL PLAN AND SECTIONS	P-002
205-03-P-118-0	TOP OF STRUCTURE - PARTIAL PLAN	P-003
205-03-P-119-0	UPPER LEVEL - PARTIAL PLAN	P-004
205-03-P-120-0	INTERMEDIATE LEVEL - PLAN	P-005
205-03-P-121-0	LOWER LEVEL - PLAN	P-006
205-03-P-122-0	SECTIONS - SHEET 1	P-007
205-03-P-123-0	SECTIONS - SHEET 2	P-008
205-03-P-124-0	TYPICAL DETAILS	P-009
205-03-E-125-0	ELECTRICAL SYMBOLS AND DETAILS	E-001
205-03-E-126-0	DEMOLITION SITE PLAN	E-002
205-03-E-127-0	TEMPORARY SITE PLAN	E-003
205-03-E-128-0	SITE PLAN	E-004
205-03-E-129-0	LOWER AND INTERMEDIATE LEVEL DEMOLITION PLANS	E-005
205-03-E-130-0	UPPER AND GROUND LEVEL DEMOLITION PLANS	E-006
205-03-E-131-0	LOWER AND INTERMEDIATE LEVEL LIGHTING PLANS	E-007
205-03-E-132-0	UPPER AND ROOF LEVEL LIGHTING PLANS	E-008
205-03-E-133-0	TOP OF STRUCTURE LIGHTING PLANS	E-009
205-03-E-134-0	LOWER AND INTERMEDIATE LEVEL POWER PLANS	E-010
205-03-E-135-0	UPPER LEVEL POWER PLAN	E-011
205-03-E-136-0	TOP OF STRUCTURE POWER PLAN	E-012

GENERAL REQUIREMENTS

DRAWING NO.	TITLE	SHEET NO.
205-03-E-137-0	DEMOLITION AND TEMPORARY POWER SINGLE LINE DIAGRAMS	E-013
205-03-E-138-0	POWER SINGLE LINE DIAGRAM	E-014
205-03-E-139-0	PANELBOARD SCHEDULES	E-015
205-03-E-140-0	CONTROL ONE LINE DIAGRAM	E-016
205-03-E-141-0	ELEMENTARY DIAGRAMS I	E-017
205-03-E-142-0	ELEMENTARY DIAGRAMS II	E-018
205-03-E-143-0	ELECTRICAL DETAILS - SHEET 1	E-019
205-03-E-144-0	ELECTRICAL DETAILS - SHEET 2	E-020

Submit all proposal pages in this section, including all executed and unexecuted pages and fasten with a clip at the upper left hand corner.

Westchester gov.com

George Latimer, Westchester County Executive

PROPOSAL PAGES

REHABILITATION OF WEAVER STREET PUMPING STATION
MAMARONECK VALLEY SANITARY SEWER DISTRICT
TOWN OF MAMARONECK, NEW YORK

Contract No. 22-526
Bid Opening: October 2, 2024

By Bidder (Please Print)	For Official Use Only
Firm/Business Name: _____	
Address: _____	_____
_____	_____

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

Division of Engineering

PROPOSAL REQUIREMENTS

BIDDER'S IDENTIFICATION

CONTRACT NO._____

To the Commissioner of Public Works, Westchester County, New York, acting for the party of the first part.

Proposal made by _____
as party of the second part.

Whose business address is _____

_____

_____

Whose telephone number is _____

Whose E-mail address is _____

Whose Federal ID number is _____

Is bidder an individual,
a partnership or a corporation? _____

If a partnership or corporation,
give the names of all partners
or officers with their titles _____

_____

_____

_____

_____

If operating under a trade name or as partners, has the required Certificate been filed with a County Clerk in accordance with the General Business Law, Section 130?

Yes....[ ] No....[ ] N.A….[ ]

If the answer is NO, Certificate must be filed before the contract can be executed.

NOTE: the bid must be submitted using the Contractor's legal name, not just the "doing business as" (i.e. DBA) name.

COMPLETE THIS FORM USING BLACK INK ONLY

PROPOSAL REQUIREMENTS

1. The undersigned, the bidder, does hereby declare that it has carefully read the contract specifications and has carefully studied the relevant plans, profiles and other drawings (as defined in Article "Contract Drawings" of the General Requirements) relating to the contract work, and has inspected the site(s) of the work..

2. The undersigned does hereby declare that it is the only one interested in its indicated bid; that the bid is in all respects without fraud or reservations; and that no official of the County or of the participating municipalities (if any), or any person in the employ of the County of participating municipalities (if any) is directly interested in the contract bid or in the supplies, equipment or works to which it relates, or in any part of the profits resulting there-from.

3. The undersigned does hereby offer and agree to furnish all materials, to fully and faithfully construct, perform and execute all work under the contract in accordance with the plans, profiles, other drawings and specifications relating thereto, and to furnish all labor, tools, implements, machinery, forms, transportation and materials necessary and proper for said purpose at the following indicated lump sum price for the total work and/or the following indicated unit prices for the various items of the work.

4. The undersigned does hereby declare that the indicated price(s) cover all expenses of every kind incidental to the completion of the contract work, including all claims affecting the work, labor and materials, which may arise through any cause whatsoever, excepting as provided for in Article "Disputed Work-Notice Of Claims For Damages: of the General Clauses.

5. The undersigned hereby agrees that in the event that the quantities of contract work actually performed by the undersigned are less than the approximate quantities indicated in the specifications it will make no claim(s) for loss of anticipated profits.

6. The undersigned does hereby agree that it will execute a contract containing all the terms, conditions, provisions and covenants necessary to complete the work according to the appropriate plans and specifications, within ten working days after receipt by the undersigned of the contract from the County, and that if it fails to execute said contract within said period of time the County may rescind the contract award and may retain as liquidated damages and not as a penalty, any amounts submitted as the bid security accompanying the undersigned's proposal, and/or demand from the Bidder's Surety Company that executed the required Bid Bond and Consent of Surety to pay to the County the difference between the amount bid and the amount for which such contract is thereafter awarded, together with the cost to the County of reletting said contract up to the maximum aggregate amount of 25% of the amount bid.

7. The undersigned does hereby agree to commence the work encompassed under the contract within ten days after notification in writing from the Commissioner of Public Works or his authorized designee, unless a definite earlier or later start has been specified, and will complete the work fully and in every respect on or before the specified completion date; and further agrees that the County has the right to employ such combination of labor, equipment

and materials as may be required for the proper completion of the contract work and to deduct all costs from such monies as may be due the undersigned, in the event the contract work is not completed by the specified completion date.

8. The undersigned does hereby agree to comply with all relevant provisions of the Labor Laws of the State of New York, and agrees to adhere to the provisions relating to the eight-hour day and five-day week, the payments of minimum rates for labor, and the latest laws relative to payments for wages for labor on public contracts.

9. The undersigned does hereby agree to insure all persons connected with the contract work against accident, at its own expense, as prescribed by the Workmen's Compensation Law of the State of New York; and that it will be responsible for payments by itself, its subcontractors and vendors of all taxes applicable to the work, and all other payments as may be required by various laws and rules and regulations of the Federal Government, the State of New York and its political subdivisions and agencies, such payments including but not limited to the following:

   A. Federal Social Security Taxes on employees' wages.

   B. Applicable Federal Excise Taxes.

   C. New York State Unemployment Insurance and Disability Payments, based on employees' wages.

10. The undersigned does hereby agree to accept their indicated lump sum price for the total work and/or their indicated unit prices for the various items of the work as the sole basis in the determination of the value of addition to, or deletions from the specified scope of the contract work.

11. ADDENDUM RECEIPT - CONTRACT NO._____

    (The undersigned shall fill in contract number above, and the required information below.)

    The undersigned does hereby acknowledge receipt of the below listed addenda to the contract specifications:

    Addendum No._____ Dated_____

    Addendum No._____ Dated_____

    Addendum No._____ Dated_____

    Addendum No._____ Dated_____

    Addendum No._____ Dated_____

COMPLETE THIS FORM USING BLACK ONLY

PROPOSAL REQUIREMENTS

12. Bidders should not submit the entire Bid document with its bid submission. Instead, Bidders must submit ALL of the Proposal Pages. Proposal Pages are denoted by a border and are titled on the bottom as "Proposal Page __".

    Be sure that, where required, the forms have been completed and signed by a notary public.

    Proposal Page 12 must be completed by a surety company and submitted with the bid if a Performance and Payment Bond is required in accordance with the "Notice to Contractors".

13. NON-COLLUSIVE BIDDING CERTIFICATION

Made pursuant to Section 103-d of the General Municipal Law of the State of New York as amended by the Laws of 1966.

A. By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief:

   1) The prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor;

   2) Unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and

   3) No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

B. A bid shall not be considered for award nor shall any award be made where a. (1), (2) and (3), above, have not been complied with; provided however, that if any case the bidder cannot make the foregoing certification, the bidder shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefore. Where a. (1), (2) and (3), above, have not been complied with, the bid shall not be considered for award nor shall any award be made unless the head of the purchasing unit of the political subdivision, public department, agency or official thereof to which the bid is made, or his designee, determines that such disclosure was not added for the purpose of restricting competition."

14. The undersigned and each person signing in behalf of the undersigned hereby executes the foregoing Affirmative Action Questionnaire, Proposal, Addendum Receipt and Non-Collusive Bidding Certification.

15. The undersigned and each person signing on behalf of the undersigned hereby certifies that

the person, firm or corporation submitting this proposal as the bidder has not been found guilty of a willful violation of the New York State Labor Law for failure to pay prevailing wages and supplements, as those terms are defined by the New York State Labor Law, within the twelve (12) months immediately preceding the submission of this bid.

16. The undersigned, by submitting the Proposal Pages, acknowledges that it has read the complete bid package including any and all addenda thereto and its bid includes all of the terms and conditions set forth in the bid documents, including, but not limited to, the Notice to Contractors, General Requirements and Proposals, Contract plans/drawings (if any), Proposal Forms, Information for Bidders, General Clauses, Sample Forms and Attachments, Sample Contract and Bond, Schedule of Hourly Rates and Supplements, Technical Specifications, any Special Notices and all applicable laws, rules and regulations. The undersigned further acknowledges that by submitting this bid the above denoted items are incorporated by reference and constitute an integral part of its bid.

17. The undersigned agrees that, if it is not the Successful bidder, the Sealed List of Subcontractors submitted with its bid can be destroyed by the County. **Please check the following box if you want the Sealed List of Subcontractors returned to you.** ☐

Dated_____, 20___

_____
Legal Name of Person, Firm or Corporation

(Seal of Corporation)

_____

_____
Business Address of Person, Firm or Corporation

By_____ _____
Signature Title

COMPLETE THIS FORM USING BLACK INK ONLY

ITEMIZED PROPOSAL

ITEM NO.	DESCRIPTION	QUANTITY	PAY UNIT	UNIT BID PRICE		AMOUNT BID	
				DOLLARS	CENTS	DOLLARS	CENTS
1	Restoration Work: For providing all labor, material and equipment necessary to complete all Work to replace items damaged by Hurricane Ida as outlined in Section 01 22 23, Measurement and Payment and as shown on the Contract Drawings and Specifications	NEC	L.S.			$	
2	Mitigation Work: For providing all labor, material and equipment necessary to complete all Work to provide future resiliency as outlined in Section 01 22 23, Measurement and Payment and as shown on the Contract Drawings and Specifications	NEC	L.S.			$	
3	All Other Work: For providing all labor, material and equipment necessary to complete all other Work as outlined in Section 01 22 23, Measurement and Payment and as shown on the Contract Drawings and Specifications	NEC	L.S.			$	
4	Typical Concrete Surface Repair – Type 1	300	S.F.	$		$	
5	Non Structural Crack Repair – Type 2	20	L.F.	$		$	
6	Structural Crack Repair – Type 3	10	L.F.	$		$	

Complete This Form Using Black Ink Only

ITEM NO.	DESCRIPTION	QUANTITY	PAY UNIT	UNIT BID PRICE		AMOUNT BID	
				DOLLARS	CENTS	DOLLARS	CENTS
7	Typical Exposed Aggregate Repair – Type 4	20	S.F	$		$	
8	Typical Expansion Joint Repair – Type 5	10	L.F.	$		$	
SUBTOTAL OF ALL ABOVE ITEMS							
W699.020001	Mobilization (Must not exceed 2.00% of Subtotal Shown Above)	NEC	L.S.				
W699.040002	Contract Bonds and Insurance (Must not exceed 3.00% of Subtotal Shown Above)	NEC	L.S.				
W800	Necessary for Miscellaneous Additional Work per Article "Miscellaneous Additional Work (Item W-800)" of Information for Bidders, as directed	NEC	L.S.			$	
						DOLLARS	CENTS
				GROSS SUM OF TOTAL BID		$	

CONTRACTOR: _____

ADDRESS: _____

_____

BY: _____

Signature/Title

CONTRACTOR'S ACKNOWLEDGMENT

(If Corporate)

STATE OF NEW YORK)
COUNTY OF WESTCHESTER) ss.:

On this _____ day of _____, 20___, before me personally came _____ _____to me known and known to me to be the_____ _____of_____the corporation described in and which executed the within instrument, who being by me duly sworn did depose and say that he the said_ _____resides at_____ _____and that he is_____of said corporation and knows the corporate seal of the said corporation; that the seal affixed to the within instrument is such corporate seal and that it was so affixed by order of the Board of Directors of said corporation, and that he signed his name thereto by like order.

_____
Notary Public

CONTRACTOR'S ACKNOWLEDGMENT

(If Individual)

STATE OF NEW YORK)
COUNTY OF WESTCHESTER) ss.:

On this _____day of _____, 20___, before me personally came _____ _____to me known, and known to me to be the same person described in and who executed the within instrument and he duly acknowledged to me that he executed the same for the purpose herein mentioned and, if operating under the trade name, that the certificate required by the New York State General Business Law Section 130 has been filed with the County Clerk of Westchester County.

_____
Notary Public

CONTRACTOR'S ACKNOWLEDGMENT

(If Co-Partnership)

STATE OF NEW YORK)
COUNTY OF WESTCHESTER) ss.:

On this _____day of _____, 20___, before me personally came _____ _____ to me known, and known to me to be a member of the firm of _____ and the person described in, and who executed the within instrument in behalf of said firm, and he acknowledged to me that he executed the same in behalf of, and as the act of said firm for the purposes herein mentioned and that the certificate required by the New York State General Business Law Section 130 has been filed with the County Clerk of Westchester County.

_____
Notary Public

COMPLETE THIS FORM USING BLACK INK ONLY

CONTRACTOR'S ACKNOWLEDGMENT

(If Corporation/Sole Officer)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 20__, before me

personally came _____ to me known and
(Name)

known to me to be the _____
(Title)

of _____, the corporation described in and which
(Name of Corporation)

executed the within instrument, who being by me duly sworn did depose and say that he/she,

resides at _____

and that he/she signed the within instrument, on behalf of said corporation, in his/her capacity

as the _____ and sole officer and director of said corporation
(Title)

and that he/she owns all the issued and outstanding capital stock of said corporation.

_____
Notary Public

COMPLETE THIS FORM USING BLACK INK ONLY

LIMITED LIABILITY COMPANY ACKNOWLEDGMENT

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 20__, before me

personally came _____ to me known to be the individual
(Name of individual who signed agreement)

who executed the foregoing instrument, and who, being duly sworn by me, did depose and say that

(s)he is (the)(a) _____ of_____,
(member)(manager) *(name of limited liability company)*

a _____ limited liability company, and that (s)he has authority
(name of state)

to sign the same, and acknowledged that (s)he executed the same as the act and deed of said limited liability company.

Sworn to before me this ____ day
of _____, 20__

_____
Notary Public

My Commission Expires on: _____

COMPLETE THIS FORM USING BLACK INK ONLY

CERTIFICATE OF AUTHORITY

I, _____

(*Officer other than officer executing proposed documents*)

certify that I am _____ of the

(*Title*)

_____

(*Name of Contractor*)

(the "Contractor"), a corporation duly organized and in good standing under the

_____

(*Law under which organized, e.g., the New York Business Corporation Law*)

named in the foregoing agreement; that _____

(*Person executing proposal documents*)

who signed said agreement on behalf of the Contractor was, at the time of execution the

_____ of the Contractor; that said agreement was

(*Title of such person*)

duly signed for and in behalf of said Contractor by authority of its Board of Directors, thereunto duly organized, and that such authority is in full force and effect at the date hereof.

_____

(*Signature*)

(SEAL)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of, _____, 20___, before me personally came _____ to me known, and known to me to be the _____ of _____, the Corporation described in and which executed the above certificate, who being by me duly sworn did depose and say that he, the said _____ resides at _____ and that he is _____ _____ of said Corporation and knows the Corporate Seal of the said Corporation; that the seal affixed to the above certificate is such Corporate Seal and that it was so affixed by order of the Board of Directors of said Corporation, and that he signed his name thereto by like order.

_____

Notary Public

COMPLETE THIS FORM IN BLACK INK ONLY

CERTIFICATE OF AUTHORITY-LIMITED LIABILITY COMPANY

I, _____,
(member or manager other than person executing the agreement)

certify that I am a _____ of _____
(member/manager) *(Name of Limited Liability Company)*

(the "LLC") duly organized under the Laws of the State of _____; that
(Name of State)

_____who signed said agreement on behalf of the LLC.
(Person Executing Agreement)

was, at the time of execution, a manager of the LLC; that said Contract was duly signed for and on behalf of said LLC and as the act of said LLC for the purposes herein mentioned.

_____
(Signature)

STATE OF NEW YORK)
ss.:
COUNTY OF _____)

On this _____ day of _____, 20___, before me personally came _____, to me known, and known to me to be the _____
(name of member/manager) *(member/manager)*
described in and who executed the above certificate, who being be me duly sworn did depose and say that he resides at _____, and he is a (member/manager) of said LLC; that he is duly authorized to execute said certificate on behalf of said LLC, and that he signed his name thereto pursuant to such authority.

_____
Notary Public *County*

My Commission Expires on:_____

COMPLETE THIS FORM USING BLACK INK ONLY

Required for all Bids over $100,000 where a Performance & Payment Bond is Required in accordance with the "Notice to Contractors"

CONTRACT NO. _____

BID BOND AND CONSENT OF SURETY

KNOW ALL PERSONS BY THESE PRESENTS, That _____
(Name of Contractor)

_____
(Address)

(hereinafter called the "Principal") and the _____ a corporation created and existing under the laws of the State of _____, having its principal office at_____ (hereinafter called the "Surety"),
(PRINT FULL ADDRESS OF SURETY)

are held and firmly bound unto the County of Westchester (hereinafter called the "Obligee"), in the full just sum of *Twenty-Five (25%) Percent of the Attached Bid*, good and lawful money of the United States of America, for the payment of which said sum of money, well and truly to be made and done, the said Principal binds themselves (himself/herself, itself), their (his/her, its) heirs, executors and administrators, successors and assigns, and the said Surety binds itself, its successors and assigns jointly and severally, firmly by these presents:

WHEREAS, the said Principal has submitted to the County of Westchester, New York, a proposal/bid for Contract Number: _____
Project Title: _____
_____ and

WHEREAS, under the terms of the Laws of the State of New York as above indicated, the said Principal has filed or intends to file this bond to guarantee that the Principal will execute all required contract documents, furnish all required insurance and furnish such Performance and Payment Bonds or other bonds as may be required in accordance with the terms of the Principal's said proposal/bid.

NOW, THEREFORE, the Surety agrees:

(i) if the Contract for which the preceding estimate and proposal is made, is awarded to the Bidder by the County, the Surety shall become bound as Surety and guarantor for the faithful performance of the Contract and shall execute and deliver a Performance & Payment Bond, in a form acceptable to the County, in the amount of 100% of the total Contract price, or such other amount as may be specified in the Bid documents, and shall execute the Contract as party of the third part when required to do so by the Board of Acquisition and Contract of the County; and

(ii) if the Bidder shall, upon award of the Contract to the Bidder, fail or refuse to execute the Contract and furnish the necessary bonds and insurance certificates, the Surety shall, on demand by the County, pay to the County the difference between the amount bid and the amount for which such contract is thereafter awarded, together with the cost to the County of reletting said Contract, up to the maximum aggregate amount of this bond.

(iii) the condition of the foregoing obligation is such, that if the said Principal shall promptly execute and submit, and the County shall accept, all required contract documents including insurance and such Performance and Payment Bond or other bonds, all as may be required in accordance with the terms of the Principal's said bid/proposal, then this obligation shall be null and void, otherwise to remain in full force and virtue.

The Surety, for value received, the receipt of which is hereby acknowledged by the Surety, hereby stipulates and agrees that the obligation of the Surety and of its bond shall remain absolute and shall be in no way impaired, affected or discharged by an extension of time, mutually agreed to by the County and the Bidder, within which the County may award said Contract, and the Surety hereby waives notice of any such extension.

IN TESTIMONY WHEREOF, the said Principal has hereunto set his/her (their, its) hand and the said Surety has caused this instrument to be signed by its duly authorized officer this_____ day of _____ 200__.

Signed and delivered this ____ day of _____ 20____ in the presence of:

_____
(Print Name of Contractor)

_____ Principal
(Signature)

_____
(Title of Authorized Officer)

_____
(Print Name of Surety)

By _____ Surety
(Signature)

_____
(Title of Authorized Officer)

(The Surety Company shall append a single copy of a statement of its financial condition, a copy of the resolution authorizing the execution of Bonds by officers of the Surety Company, Power of Attorney, Surety Acknowledgment.)

AFFIRMATIVE ACTION PROGRAM REQUIREMENT

Affirmative Action Program

An approved Affirmative Action Plan shall be required in all contracts for public work where the awarded contract amount exceeds $50,000 or more than fourteen (14) persons are employed by the Contractor and/or his subcontractors.

Does the Contractor participate in an approved Affirmative Action Program? Yes [ ] No [ ]

If Yes, give name of Program: _____

_____

If No, how many employees (total) does the Contractor employ. Please also include in your count the number of employees the Contractor and its Subcontractors expect to use on this project: _____

An approved Affirmative Action Program shall mean a plan approved or adopted by Westchester County including but not limited to, the Home-Town Plan, the Recruitment Training Program or any other program approved or meeting the requirements of the State or Federal government.

The "Monthly Employment Utilization Report" of the Sample Forms, shall be filled out by the Contractor and/or Subcontractor(s) who are required to have an Affirmative Action Program, prior to the start of the work.

Before any subcontractor is approved for use on this contract it will have to complete and submit the "Affirmative Action Program Requirement- Subcontractors" form of the Sample Forms.

COMPLETE THIS FORM USING BLACK INK ONLY

APPRENTICESHIP TRAINING PROGRAM REQUIREMENT

Apprenticeship Training Program

An approved Apprenticeship Training Program shall be required in all contracts for public work where the awarded contract amount exceeds $50,000. and more than fourteen (14) persons are employed by the Contractor or Subcontractor(s).

Will the Contractor utilize apprentices for this Contract? Yes [ ] No [ ]

If Contractor Yes, do the apprentices participate in an approved Apprenticeship Training Program? Yes [ ] No [ ]

If Contractor Yes, give the name of the Program: _____

_____

Will the Subcontractor(s) utilize apprentices for this Contract? Yes [ ] No [ ]

If Subcontractor(s) Yes, do the apprentices participate in an approved Apprenticeship Training Program? Yes [ ] No [ ]

If Subcontractor(s) Yes, give the name of the Program: _____

_____

AN APPROVED APPRENTICESHIP TRAINING PROGRAM SHALL MEAN A NEW YORK STATE REGISTERED APPRENTICESHIP TRAINING PROGRAM AS DEFINED UNDER THE NEW YORK STATE LABOR LAW.

COMPLETE THIS FORM USING BLACK INK ONLY

CERTIFICATE OF LICENSE

(TO BE COMPLETED BY AN ELECTRICAL BIDDER ONLY)

_____, being duly sworn
(Name)

deposes and says that the following statements are true:

(1) I am the _____ of the
(Title)

_____, the bidder named on the
(Name of Contractor)

bid proposal, and I have read and am familiar with: a) the electrical license requirements contained in the Information for Bidders of the bid, b) Chapter 277 Article XVII of the Laws of Westchester County entitled Electrical Licensing Board and the Licensing of Master Electricians, and c) the Westchester County Electrical Licensing Board Rules and Regulations.

(2) I am familiar with, and this bid is being submitted in compliance with, the Westchester County Electrical Licensing Board Rules and Regulations, in particular No. 11, which states as follows:

> No individual holding a Master Electrician's License shall lend such License to any person or allow any other person to carry on, engage in, or labor at the business as defined herein of installing, removing, altering, testing, replacing, or repairing electrical systems. A violation of this section by any person holding a License shall be sufficient cause for revocation of such License.
>
> However, nothing herein shall be construed to prohibit the use of a License by the holder thereof for or on behalf of a partnership, corporation or other business association, provided that fifty-one (51) percent or more of the control of the voting capital stock of such partnership, corporation, or other business association is owned by one (1) or more holders of a Westchester County Master Electrical License and that all work performed by such partnership, corporation or other business association is performed by or under the direct supervision of such License holder or holders.

(3) That, as of this date, the bidder submitting the bid possesses the applicable valid Master/"Special" Electrician's license issued by the Westchester County Electrical Licensing Board; that this License is being used in compliance with the Laws of Westchester County and Westchester County Electrical Licensing Board Rules and Regulations; and **I have provided a copy of such license with the sealed bid proposal**.

COMPLETE THIS FORM USING BLACK INK ONLY

CERTIFICATE OF LICENSE (Continued)

(TO BE COMPLETED BY AN ELECTRICAL BIDDER ONLY)

(4) That all electrical work shall be performed in accordance with the requirements of Chapter 277 Article XVII of the Laws of Westchester County entitled Electrical Licensing Board and the Licensing of Master Electricians and the Westchester County Electrical Licensing Board Rules and Regulations.

(5) That I make this statement in connection with the submission of the bid as proof of the required electrical license, knowing that this statement will be relied upon by the County in the evaluation of that bid.

_____

Signature

Sworn to before me
this _____ day of _____

_____

License No.

_____
Notary Public - State of New York

COMPLETE THIS FORM USING BLACK INK ONLY

CERTIFICATE OF LICENSE

(TO BE COMPLETED BY A PLUMBING BIDDER ONLY)

_____, being duly sworn
(Name)

deposes and says that the following statements are true:

(1) I am the _____ of the
(Title)

_____, the bidder named on the
(Name of Contractor)

bid proposal, and I have read and am familiar with: a) the plumbing license requirements contained in the Information for Bidders of the bid, b) Chapter 277 Article XV of the Laws of Westchester County entitled Westchester County Board of Plumbing Examiners and County-wide Plumbing License, and c) the Westchester County Board of Plumbing Examiners Rules and Regulations.

(2) I am familiar with, and this bid is being submitted in compliance with, Section 277.509A of Article XV of Chapter 277 of the Laws of Westchester County, which states as follows:

> A. No holder of a license or certification issued under this article shall authorize, consent to or permit the use of his or her license or certification by or on behalf of any other person. No person who has not qualified or obtained a license or certification under this article shall represent himself or herself to the public as holder of a license or certification issued under this article, either directly, by means of signs, sign cards metal plates or stationery, or indirectly in any other manner whatsoever. However, nothing herein shall be construed to prohibit the use of a license by the holder thereof for or on behalf of a partnership, corporation or other business association, provided that 51 percent or more of the control of the voting capital stock of such partnership, corporation or other business association is owned by one or more holders of a Westchester County master plumbing license and that all work performed by such partnership, corporation or other business association is performed by or under the direct supervision of such license holder or holders.

(3) That, as of this date, the bidder submitting the bid possesses a valid Master Plumber's license issued by the Westchester County Board of Plumbing Examiners; that this License is being used in compliance with the Laws of Westchester County and the Westchester County Board of Plumbing Examiners Rules and Regulations; and **I have provided a copy of such license with the sealed bid proposal**.

COMPLETE THIS FORM USING BLACK INK ONLY

CERTIFICATE OF LICENSE (Continued)

(TO BE COMPLETED BY A PLUMBING BIDDER ONLY)

(4) That all plumbing work shall be performed in accordance with the requirements of Chapter 277, Article XV of the Laws of Westchester County entitled Westchester County Board of Plumbing Examiners and County-wide Plumbing License, and the Westchester County Board of Plumbing Examiners Rules and Regulations.

(5) That I make this statement in connection with the submission of the bid as proof of the required plumbing license, knowing that this statement will be relied upon by the County in the evaluation of that bid.

_____

Signature

Sworn to before me
this _____ day of _____

_____

License No.

_____
Notary Public - State of New York

COMPLETE THIS FORM USING BLACK INK ONLY

CERTIFICATE OF LICENSE

(TO BE COMPLETED BY A HAULING BIDDER OR SUBCONTRACTOR ONLY)

_____, being duly sworn
(Name)

deposes and says that the following statements are true:

(1) I am the _____ of the
(Title)

_____, the bidder/subcontractor (circle one)
(Name of Contractor)

named on the foregoing bid proposal, and I have read and am familiar with the hauling license requirements contained in the Information for Bidders of the foregoing bid.

(2) That, as of this date, the bidder submitting the foregoing bid/subcontractor of the bidder submitting the foregoing bid (circle one) possesses a valid _____ license
(License type, i.e. Class "A")
issued by the Westchester County Solid Waste Commission.

(3) That all hauling work shall be performed in accordance with the requirements of Chapter 826-a of the Laws of Westchester County.

(4) That I make this statement in connection with the submission of the foregoing bid as proof of the required hauling license, knowing that this statement will be relied upon by the County in the evaluation of that bid.

_____

Signature

Sworn to before me
this _____ day of _____

_____

License No.

_____
Notary Public - State of New York

COMPLETE THIS FORM USING BLACK INK ONLY

STORMWATER POLLUTION PREVENTION CERTIFICATION

I certify under penalty of law that I understand and agree to comply with the terms and conditions of the Stormwater Pollution Prevention Plan ("SPPP") for the construction site identified in such SPPP as a condition of authorization to discharge stormwater. I also understand the operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and it is unlawful for any person to contribute to a violation of water quality standards.

_____

Signature

Sworn to before me
This _____day of _____, 200_.

_____

Notary Public – State of New York, County of _____
My Commission Expires on _____.

This Certification will also have to be signed by your subcontractors. *Additional copies of this form can be acquired from the Department of Public Works.*

COMPLETE THIS FORM USING BLACK INK ONLY

PREVAILING WAGE RATES AND SUPPLEMENTS

Compliance with the New York State Construction (Article 1, Section 17) and the New York State Labor Law (Section 220)

Is your firm in full compliance with the New York State Labor Law?
(Please check one)

Yes _____ No _____

Are the wage supplements paid into a Federally approved program?
(Please check one)

Yes _____ No _____

If Yes, please indicate which program:

_____

_____

_____

If No, please indicate how the supplements are being paid:

_____

_____

_____

Yes, I have read and understand the terms of this Contract and the laws of this Agreement:

_____ Date: _____
Signature

_____ Date: _____
Notary Public

COMPLETE THIS FORM USING BLACK INK ONLY

MINORITY/WOMEN BUSINESS ENTERPRISE PROGRAM QUESTIONNAIRE
QUESTIONNAIRE REGARDING BUSINESS ENTERPRISES
OWNED AND CONTROLLED BY WOMEN OR PERSONS OF COLOR

As part of the County's program to encourage the meaningful and significant participation of business enterprises owned and controlled by persons of color or women in County contracts, and in furtherance of Section 308.01 of the Laws of Westchester County, completion of this form is required.

A "business enterprise owned and controlled by women or persons of color" means a business enterprise, including a sole proprietorship, limited liability partnership, partnership, limited liability corporation, or corporation, that either:

1.) meets the following requirements:
   a. is at least 51% owned by one or more persons of color or women;
   b. is an enterprise in which such ownership by persons of color or women is real, substantial and continuing;
   c. is an enterprise in which such ownership interest by persons of color or women has and exercises the authority to control and operate, independently, the day-to-day business decisions of the enterprise; and
   d. is an enterprise authorized to do business in this state which is independently owned and operated.

2.) is a business enterprise certified as a minority business enterprise ("MBE") or women business enterprise ("WBE") pursuant to Article 15-a of the New York State Executive Law and the implementing regulations, 9 New York Code of Rules and Regulations subtitle N Part 540 et seq., **OR**

3.) is a business enterprise certified as a small disadvantaged business concern pursuant to the Small Business Act, 15 U.S.C. 631 et seq., and the relevant provisions of the Code of Federal Regulations as amended.

Please note that the term "persons of color," as used in this form, means a United States citizen or permanent resident alien who is and can demonstrate membership of one of the following groups:

(a) Black persons having origins in any of the Black African racial groups;
(b) Hispanic persons of Mexican, Puerto Rican, Dominican, Cuban, Central or South American descent of either Indian or Hispanic origin regardless of race;
(c) Native American or Alaskan native persons having origins in any of the original peoples of North America; or
(d) Asian or Pacific Islander persons having origins in any of the Far East countries, South East Asia, the Indian subcontinent or the Pacific Islands.

1. Are you a business enterprise owned and controlled by women or persons of color in accordance with the standards listed above?

_____ No

_____ Yes

Please note: If you answered "yes" based upon certification by New York State and/or the Federal government, official documentation of the certification must be attached.

2. If you answered "Yes" above, please check off below whether your business enterprise is owned and controlled by women, persons of color, or both.

_____ Women

_____ Persons of Color (*please check off below all that apply)*

_____ Black persons having origins in any of the Black African racial groups
_____ Hispanic persons of Mexican, Puerto Rican, Dominican, Cuban, Central or South American descent of either Indian or Hispanic origin regardless of race
_____ Native American or Alaskan native persons having origins in any of the original peoples of North America
_____ Asian or Pacific Islander persons having origins in any of the Far East countries, South East Asia, the Indian sub-continent or the Pacific Islands

Name of Business Enterprise: _____

Address: _____

_____

Name and Title of person completing questionnaire: _____

_____

Signature: _____

_____ _____

Notary Public Date

CONTRACTOR'S DISCLOSURE STATEMENT

Instructions:

The County of Westchester, in order to insure that it employs responsible contractors for its major construction projects, requires all bidders for construction contracts (which includes reconstruction and repair) with an estimated value of One Hundred Thousand ($100,000.00) or more Dollars to answer completely and swear to the questions below. If a Contractor Disclosure Statement has been included with this bid specification, then the County has determined that it is applicable to this bid. All subcontractors whose contract has a value of One Hundred Thousand ($100,000.00) or more Dollars must also submit a Contractor Disclosure Statement.

Please read the questions carefully and answer them completely. Before you answer these questions, please read the definitions of terms used in these questions. While you may contact the Department of Public Works if you have questions about this form, the County cannot provide you with any legal advice for which you must contact your own lawyer. **FAILURE TO COMPLETE THIS CONTRACTOR DISCLOSURE STATEMENT IN GOOD FAITH MAY RESULT IN THE REJECTION OF YOUR BID**.

If you have previously filled out a Contractor Disclosure Statement for another County bid and only some but not all of your responses have changed, attach a copy of the prior Contractor Disclosure Statement and check #2 below indicating changes only and only answer those questions which have changed since you last filled out the Contractor Disclosure Statement.

If you have previously completed a Contractor Disclosure Statement for another County bid and nothing has changed in your responses to the questions, then check #3 and fill out the attached No Change Affidavit. Attach a copy of the prior Contractor Disclosure Statement to the No Change Affidavit.

NOTE IF THE SPACES PROVIDED FOR ANSWERS ARE NOT SUFFICIENT FOR YOU TO COMPLETE YOUR ANSWER TO A PARTICULAR QUESTION, THEN ATTACH ADDITIONAL PAGES TO THIS CONTRACTOR DISCLOSURE STATEMENT WHICH INDICATE THE NUMBER OF THE QUESTION THAT YOU ARE COMPLETING THE ANSWER FOR.

ALSO DO NOT LEAVE ANY ANSWERS BLANK. IF A QUESTION IS NOT APPLICABLE, ANSWER - N/A – AND OFFER A BRIEF EXPLANATION AS TO WHY THE QUESTION DOES NOT APPLY.

Definitions:

Affiliate – is another Business Entity in which the Contractor or one or more of the Principals of the Contractor has an ownership interest of more than fifty (50%) percent. An Affiliate is also another Business Entity in which the Parent of the Contractor owns more than fifty (50%) percent of that other Business Entity.

Agency or Government Agency – is any Federal, State, City or other local agency including, but not limited to, departments, offices, quasi-public agencies, public authorities and

corporations, boards of education and higher education, public development corporations and local development corporations.

Assignee – is a person or Business Entity to whom an assignment (e.g., a transfer to another of any property, real or personal, including a transfer of any rights in such property) is made.

Business Address – is the location of principal executive offices and is also the primary place of business in Westchester County, if different.

Business Entity – is any profit-seeking business including, but not limited to, corporations, limited and general partnerships, joint ventures and individual (sole) proprietorships.

Contract – is any binding agreement with any Government Agency or other Business Entity for the provision of goods, or services including, but not limited to, construction.

Contractor – is the Business Entity submitting this Contractor Disclosure Statement.

Contractor Disclosure Statement – is this document.

Control – A Business Entity controls another Business Entity when:

- The controlling Business Entity owns more than fifty (50%) percent of the controlled Business Entity, or
- The controlling Business Entity directs or has the right to direct daily operations of the controlled Business Entity, or
- The same person is a Principal in both businesses and directs the daily operations of the controlled Business Entity.

Investigations – is any official inquiry by any Government Agency, with the exception of background investigations for employment.

Officer – is any individual who serves in the function of chief executive officer, chief financial officer or chief operating officer of the Business Entity by whatever titles known.

Parent – is a Business Entity which owns more than fifty (50%) percent of another Business Entity.

Principal – is an individual, partnership, joint venture or corporation which holds ten (10%) percent or more ownership interest in the Business Entity.

Partner – shall mean a person or Business Entity that has a joint ownership in a particular business, but the ownership interest is not as a shareholder of a corporation.

Successor – is a person or Business Entity that takes the place that another has left. With reference to a corporation, a successor shall mean another corporation which, through amalgamation, consolidation, or other legal succession, becomes invested with the rights and assumes the burdens of the first corporation.

CONTRACTOR'S DISCLOSURE STATEMENT

CONTRACT NO.:_____

☐ Check if Subcontractor

Type Of Submission

(*Put a X or √next to the applicable type of submission*)

1. **Fully Completed Contractor Disclosure Statement** _____
(*Sign Oath on last page of Disclosure Statement*)

2. **Changes Only Contractor Disclosure Statement** _____
(*Attach copy of previously filed Contractor Disclosure Statement that you are amending. Denote any changes on the following Contractor Disclosure Statement. Sign Oath on last page of this Disclosure Statement*)

3. **No Change** _____
(*Fill out "No Change Affidavit" [below] and attach copy of previously filed Contractor Disclosure Statement*)

NO CHANGE AFFIDAVIT

I swear that the attached Contractor Disclosure Statement was submitted to the County of Westchester on _____ and was true as signed, and that
(*Date*)
since the above date nothing has occurred which changes in any way the responses made to the questions contained in the attached Contractor Disclosure Statement.

Submitted by: _____
(Signature)
Name (Print): _____
Title (Print): _____

Sworn to before me this ____ day of _____, 200_

_____
NOTARY PUBLIC

COMPLETE THIS FORM USING BLACK INK ONLY

CONTRACTOR'S DISCLOSURE STATEMENT

Questions:

1. The Business Address and taxpayer identification number of Contractor and primary telephone number for such location.

2. List the Business Addresses and primary telephone numbers for such locations, if different from answer to #1 above, where Contractor has been located over the last five (5) years.

3. List all other names and taxpayer identification numbers under which the Contractor, or the Principals and Officers of Contractor, have conducted business within the prior five (5) years.

4. For any response to #3 above, list any and all Westchester County contracts that were awarded to such "other name" Business Entity.

5. List the type of Business Entity that the Contractor is presently organized as (for example - sole proprietorship, partnership, joint venture or corporation).

COMPLETE THIS FORM USING BLACK INK ONLY

6. If Contractor is a corporation, list the date that the Contractor was incorporated. Also list the name of the Government Agency and location of said Agency in which a certificate of incorporation, certificate of doing business or equivalent, has been filed and the date of any amendments thereto. If, however, the Contractor is a partnership, list the date that the partnership was formed and the name of the Government Agency and location of said Agency in which a business certificate for partnership or equivalent has been filed.

7. List all the names, current Business Addresses and business telephone numbers of the Principals and Officers of the Contractor. If the Contractor is a partnership, list all partners and their business telephone numbers.

8. List the names, current Business Addresses, telephone numbers and taxpayer identification numbers of all Affiliates of the Contractor.

9. List all the names, Business Addresses and telephone numbers of the Principals and Officers of the Affiliates listed in response to #7 above. If the Affiliate is a partnership, list the Business Addresses and business telephone numbers of all partners.

COMPLETE THIS FORM USING BLACK INK ONLY

10. Is the Contractor Controlled by another Business Entity? ____Yes ____No. If you answered yes, please identify the name, Business Address and telephone number of that Controlling Business Entity and list any contracts that the Controlling Business Entity has had with Westchester County in the past five (5) years?

    _____
    _____
    _____
    _____
    _____

11. If the Contractor has Control of any other Business Entity that has had a Contract with the County of Westchester in the past five (5) years, please identify the name, Business Address and telephone number of that Controlled Business Entity.

    _____
    _____
    _____
    _____
    _____

12. List any and all contract sanctions imposed on the Contractor or on a Business Entity listed in response to #3 above that was imposed by a Government Agency during the prior five (5) years, including, but not limited to, all cautions, suspensions, debarments, cancellations of a contract based on business conduct, declarations of default, determinations of ineligibility to bid or whether any proceedings to determine eligibility to bid are pending.

    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____
    _____

13. List the contract sanction history for the past five (5) years, as defined in #12 above, for any Affiliate of the Contractor.

    _____
    _____
    _____
    _____
    _____
    _____
    _____

COMPLETE THIS FORM USING BLACK INK ONLY

14. If you answered yes to #10 above, list the contract sanction history as defined in #12 above for the Controlling Business Entity during the past five (5) years.

15. List any and all prevailing wage or supplement payment violations; state labor law violations deemed willful and any other federal or state citations, notices, violation orders, pending administrative hearings or proceedings or determinations of a violation of any labor law or regulation regarding the Contractor.

16. List all Investigations of the Contractor, its Principals and Officers or, if a partnership, of the Contractor's Partners. Also list all investigations of Affiliates, their Principals and Officers or, if a partnership, of their Partners.

COMPLETE THIS FORM USING BLACK INK ONLY

17. Have all Federal and State income tax returns, if required, been filed by Contractor during the last five (5) years? ____Yes ____No If you answered no, please explain why such returns were not filed.

_____
_____
_____
_____
_____

18. Are there any criminal proceedings pending against the Contractor or any Principal or Officer of the Contractor or partner, if Contractor is a partnership? ____Yes _____No If you answered yes, please provide details of the pending criminal proceedings.

_____
_____
_____
_____
_____
_____

19. List the record of all criminal convictions of the Contractor, any Principal or Officer or partner, if Contractor is a partnership, and of any former Principal or Officer, of the Contractor or former partner, if Contractor is a partnership, for any crime related to truthfulness or business conduct and for any felony committed within the prior ten (10) years.

_____
_____
_____
_____
_____
_____
_____
_____

20. List all bankruptcy proceedings that the Contractor or its Affiliates have been the subject of within the past seven (7) years, whether pending or completed.

_____
_____
_____
_____
_____
_____
_____
_____

COMPLETE THIS FORM USING BLACK INK ONLY

21. Is the Contractor a successor, assignee or Affiliate of a Business Entity that has ever been denied a Contract or deemed ineligible to bid on a Government Agency contract?
____Yes No ____ If you answered yes, explain below.

_____
_____
_____
_____
_____
_____
_____
_____

OATH

I swear that all of the above answers are true based on my knowledge of the facts, or are believed by me to be true, based upon a review of records containing the facts or based upon information I obtained from someone who has knowledge of the facts; and that I have authority to sign this document; and that the answers given above have not been made in a manner intended to deceive or to defeat the purpose of the Contractor Disclosure Statement, which is to assist the County of Westchester in determining if the Contractor is a responsible bidder.

Submitted by: _____
(Signature)

Name (Print): _____

Title (Print): _____

Sworn to before me this ____ day of

_____, 20__

_____
NOTARY PUBLIC

COMPLETE THIS FORM USING BLACK INK ONLY

REQUIRED DISCLOSURE OF RELATIONSHIPS TO COUNTY

(Prior to execution of a contract by the County, a potential County contractor must complete, sign and return this form to the County)

Contract Name and/or ID No.:
(To be filled in by County)
Name of Contractor:
(To be filled in by Contractor)

A potential County contractor must complete this form as part of the proposed County contract.

1.) Are any of the employees that the Contractor will use to carry out this contract also a County officer or employee, or the spouse, child, or dependent of a County officer or employee?

Yes _____ No _____

If yes, please provide details (attach extra pages, if necessary): _____
_____

2.) Are any of the owners of the Contractor or their spouses a County officer or employee?

Yes _____ No _____

If yes, please provide details (attach extra pages, if necessary): _____
_____

3.) Do any County officers or employees have an **interest**[1] in the Contractor or in any approved subcontractor that will be used for this contract?

Yes _____ No _____

If yes, please provide details (attach extra pages, if necessary): _____
_____

By signing below, I hereby certify that I am authorized to complete this form for the Contractor.

_____

Name: _____
Title: _____
Date: _____

[1] "Interest" means a direct or indirect pecuniary or material benefit accruing to a County officer or employee, his/her spouse, child or dependent, whether as the result of a contract with the County or otherwise. For the purpose of this form, a County officer or employee shall be deemed to have an "interest" in the contract of:

1.) His/her spouse, children and dependents, except a contract of employment with the County;
2.) A firm, partnership or association of which such officer or employee is a member or employee;
3.) A corporation of which such officer or employee is an officer, director or employee; and
4.) A corporation of which more than five (5) percent of the outstanding capital stock is owned by any of the aforesaid parties.

QUESTIONNAIRE REGARDING BUSINESS ENTERPRISES OWNED AND CONTROLLED BY SERVICE-DISABLED VETERANS

The County believes it is a laudable goal to provide business opportunities to veterans who were disabled while serving our country, and wants to encourage the participation in County contracts of certified business enterprises owned and controlled by service-disabled veterans. As part of the County's program to encourage the participation of such business enterprises in County contracts, and in furtherance of Article 17-B of the New York State Executive Law, we request that you answer the questions listed below.

The term "Certified Service-Disabled Veteran-Owned Business" shall mean a business that is a certified service-disabled veteran-owned business enterprise under the New York State Service-Disabled Veteran-Owned Business Act (Article 17-B of the Executive Law).

1. Are you a business enterprise that is owned and controlled by a service-disabled veteran in accordance with the standards listed above?

_____ No
_____ Yes

2. Are you certified with the State of New York as a Certified Service-Disabled Veteran-Owned Business?

_____ No
_____ Yes

3. If you are certified with the State of New York as a Certified Service-Disabled Veteran-Owned Business, please attach a copy of the certification.

Name of Firm/Business Enterprise: _____
Address: _____
Name/Title of Person completing Questionnaire: _____
Signature: _____

STATE OF NEW YORK)
) ss.:
COUNTY OF)

_____

Notary Public

Date:

SCHEDULE "F"
CRIMINAL BACKGROUND DISCLOSURE
INSTRUCTIONS

Pursuant to Executive Order 1-2008, the County is required to maintain a record of criminal background disclosure from all persons providing work or services in connection with any County contract, including leases of County-owned real property and licenses:

a.) If any of the persons providing work or services to the County in relation to a County contract are not subject to constant monitoring by County staff while performing tasks and/or while such persons are present on County property pursuant to the County contract; and
b.) If any of the persons providing work or services to the County in relation to a County contract may, in the course of providing those services, have access to sensitive data (for example SSNs and other personal/secure data); facilities (secure facilities and/or communication equipment); and/or vulnerable populations (for example, children, seniors, and the infirm).

In those situations, the persons who must provide a criminal background disclosure ("Persons Subject to Disclosure") include the following:

a.) Consultants, Contractors, Licensees, Lessees of County-owned real property, their principals, agents, employees, volunteers or any other person acting on behalf of said Contractor, Consultant, Licensee, or Lessee who is at least sixteen (16) years old, including but not limited to Subconsultants, subcontractors, Sublessess, or Sublicensees who are providing services to the County, and
b.) Any family member or other person, who is at least sixteen (16) years old, residing in the household of a County employee who lives in housing provided by the County located on County property.

Under Executive Order 1-2008, it is the duty of every County Consultant, Contractor, Licensee, or Lessee to inquire of each and every Person Subject to Disclosure and disclose whether they have been convicted of a crime or whether they are subject to pending criminal charges, and to submit this form with that information.[1] Accordingly, you are required to complete the attached Criminal Background Disclosure Form and Certification.

Please note that under no circumstances shall the existence of a language barrier serve as a basis for the waiver of or an exception from the disclosure requirements of Executive Order 1-2008. If translation services are required by the Consultant, Contractor, Licensee, or Lessee to fulfill this obligation, it shall be at the sole cost and expense of the Consultant, Contractor, Licensee, or Lessee.

Please also note that the conviction of a crime(s) and/or being subject to a pending criminal charge(s) will not automatically result in a denial of a person's right to work on a County contract, right to be on County property, or license, but may, if the County determines that the prior conviction(s) or pending criminal charge(s) create an unacceptable risk. However, if a person fails to list or falsifies any part of his/her conviction history or any pending criminal charge(s) for any reason, he/she may be prohibited from working or being on County property without any risk assessment. If it is later determined that a Person Subject to Disclosure failed to disclose a criminal conviction or pending criminal charge for any reason, his/her right to work on a County contract, be on County property, or license may be terminated at any time.

Please further note that, pursuant to Executive Order 1-2008, and subject to the applicable provisions of New York Correction Law §§ 752 and 753, the County has the right to bar a Person Subject to Disclosure from providing work or services to the County or from being on County property if any such person has:

a.) A conviction of a crime(s);
b.) A pending criminal proceeding for a crime(s); or
c.) Refused to answer questions concerning his/her criminal background

[1] For these disclosures, a "crime" or "pending criminal charge" includes all felonies and misdemeanors as defined under the New York State Penal Law or the equivalent under Federal law or the laws of any other State.

Please finally note that any failure by a County Consultant, Contractor, Licensee, or Lessee to comply with the disclosure requirements of Executive Order 1–2008 may be considered by the County to be a material breach and shall be grounds for immediate termination by the County of the related County contract.

Exemptions

Executive Order 1-2008 exempts from the aforementioned disclosure requirements Persons Subject to Disclosure:

a.) for whom the County has already conducted a background check and issued a security clearance that is in full force and effect; and

b.) for whom another state or federal agency having appropriate jurisdiction has conducted a security and/or background clearance or has implemented other protocols or criteria for this purpose that apply to the subject matter of a County contract that is in full force and effect.

If you are claiming an exemption for one or more Persons Subject to Disclosure, you must notify the Procuring Officer[2]. The Procuring Officer will then determine whether the Person(s) Subject to Disclosure are actually exempt, and provide written notification of his/her determination. If the Procuring Officer determines that a Person Subject to Disclosure is not exempt, the Procuring Officer will notify you of that determination, and you will have to include disclosures for that person on your Criminal Background Disclosure Form and Certification.

[2] Procuring Officer" shall mean the head of the department or the individual or individuals authorized by the head(s) of the department(s) undertaking the procurement and with respect to those matters delegated to the Bureau of Purchase and Supply pursuant to Section 161.11(a) of the Laws of Westchester County, the Purchasing Agent.

Subconsultants, Subcontractors, Sublessees, or Sublicensees

Under Executive Order 1-2008, it is your duty to ensure that any and all approved subconsultants, subcontractors, sublessees, or sublicensees complete and submit the attached Criminal Background Disclosure Form and Certification for all of their respective Persons Subject to Disclosure. This must be done before such a subconsultant, subcontractor, sublessees, or sublicensees can be approved to perform work on a contract.

New Persons Subject to Disclosure

Under Executive Order 1-2008, you have a **CONTINUING OBLIGATION** to maintain the accuracy of the Criminal Background Disclosure Form and Certification (and any accompanying documentation) for the duration of this contract, including any amendments or extensions thereto. Accordingly, it is your duty to complete and submit an updated Criminal Background Disclosure Form and Certification whenever there is a new Person Subject to Disclosure for this contract. **NO NEW PERSON SUBJECT TO DISCLOSURE SHALL PERFORM WORK OR SERVICES OR ENTER ONTO COUNTY PREMISES UNTIL THE UPDATED CRIMINAL BACKGROUND DISCLOSURE FORM AND CERTIFICATION IS FILED WITH THE PROCURING OFFICER.** You shall also provide the County with any other updates that may be necessary to comply with the disclosures required by Executive Order 1-2008.

PLEASE CONTINUE TO THE

Criminal Background Disclosure Form and Certification

BEGINNING ON THE NEXT PAGE

CONTRACT #:_____

Name of Consultant, Contractor, Lessee, or Licensee: _____

CRIMINAL BACKGROUND DISCLOSURE FORM AND CERTIFICATION

If this form is being completed by a subconsultant, subcontractor, sublessee, or sublicensee, please consider all references in this form to "consultant, contractor, lessee, or licensee" to mean "subconsultant, subcontractor, sublessee, or sublicensee" and check here: _____

I, _____, certify that I am a principal or a
(Name of Person Signing Below)

representative of the Consultant, Contractor, Lessee, or Licensee and I am authorized to complete and execute this Criminal Background Disclosure Form and Certification. I certify that I have asked each Person Subject to Disclosure the following questions:

- **Have you or your company ever been convicted of a crime (all felonies and misdemeanors as defined under the New York State Penal Law or the equivalent under Federal law or the laws of any other State) including, but not limited to, conviction for commission of fraud, embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements or receiving stolen property?**

- **Are you or your company subject to any pending criminal charges (all felonies and misdemeanors as defined under the New York State Penal Law or the equivalent under Federal law or the laws of any other State)?**

I certify that the names and titles of Persons Subject to Disclosure who refused to answer **either** of the questions above are:

1. _____
2. _____
3. _____
4. _____
5. _____

(If more space is needed, please attach separate pages labeled "REFUSED to Answer - Continued.")

I certify that the names and titles of Persons Subject to Disclosure who answered "Yes" to **either of the** questions above are:

1. _____

2. _____

3. _____

4. _____

5. _____

(If more space is needed, please attach separate pages labeled "YES Answers - Continued.")

Each Person Subject to Disclosure listed above who has either **been convicted of a crime(s)** and/or **is subject to a pending criminal charge(s)** must answer additional questions. Those questions are below.

A Person Subject to Disclosure who has **been convicted of a crime(s)** must respond to the following (please attach separate pages with responses for each person, with their name and title):

1.) Describe the reason for being on County property if applicable, identify the specific duties and responsibilities on this project which you intend to perform for the County, including but not limited to, access to sensitive data and facilities and access to vulnerable populations.
2.) Please list all criminal convictions along with a brief description of the crime(s) (including all felonies and misdemeanors as defined under the New York State Penal Law or the equivalent under Federal law or the laws of any other State).
3.) Please provide the date and place of each conviction.
4.) Please provide your age at the time of each crime for which you were convicted.
5.) Please provide the legal disposition of each case.
6.) Please provide any information either produced by yourself or someone on your behalf in regards to your rehabilitation and good conduct.

A Person Subject to Disclosure who **is subject to a pending criminal charge(s)** must respond to the following (please attach separate pages with responses for each person, with their name and title):

1.) Describe the reason for being on County property and if applicable, identify the specific duties and responsibilities on this project which you intend to perform for the County, including but not limited to, access to sensitive data and facilities and access to vulnerable populations.
2.) Please identify all pending criminal charges (all felonies and misdemeanors as defined under the New York State Penal Law or the equivalent under Federal law or the laws of any other State).
3.) Please briefly describe the nature of the pending charges and the date upon which it is alleged that a crime was committed.

I hereby certify that all of the information provided herein (and in any and all attachments) is true and accurate and that all disclosures required by Executive Order 1-2008 and this Criminal Background Disclosure Form and Certification have been completed. By my signature below, I hereby affirm that all of the facts, statements and answers contained herein (and in any and all attachments) are true and correct. I understand that providing false or incomplete information or withholding by omission or intention pertinent information will be cause for refusing further consideration of my being utilized under this contract.

It is understood and agreed that no Person Subject to Disclosure shall perform work or services or enter onto County property until this required Criminal Background Disclosure Form and Certification is filed with the Procuring Officer.

It is understood and agreed that to the extent that new Persons Subject to Disclosure are proposed to perform work or provide services under this contract after filing of this Criminal Background Disclosure Form and Certification with the Procuring Officer, such new Persons Subject to Disclosure shall not perform work or provide services or enter into County property until an updated Criminal Background Disclosure Form and Certification has been filed with the Procuring Officer.

It is further understood and agreed that the consultant, contractor, lessee, or licensee has a continuing obligation to maintain the accuracy of the Criminal Background Disclosure Form and Certification for the duration of this contract, including any amendments or extensions thereto, and shall provide any updates to the information to the County as necessary to comply with the requirements of Executive Order 1-2008.

_____

Name: _____
Title: _____
Date: _____

_____ _____
Notary Public Date

SUBCONTRACTOR'S SEALED BID SUBMISSION

Westchester County Contract No.:_____

Name of Subcontractor:_____

Address:_____

Phone #:_____ **Fax #:**_____

E-mail address:_____

Name of Contractor to whom this bid is submitted:_____

Scope of Work to be performed by Subcontractor (e.g., electrical, plumbing, HVAC):

_____

_____

The price agreed upon by and between Contractor and Subcontractor for the full performance of the Subcontractor's work:

$:_____

In words (e.g, one hundred thousand dollars and xx/100):

_____

_____

Subcontractor	**Contractor**
_____	_____
Signature	Signature
By_____	**By**_____
(print name & title)	**(print name & title)**

THE SUCCESSFUL LOW BIDDER, BEFORE AWARD OF THE CONTRACT, MUST PROCURE AND PROVIDE TO THE COUNTY, FROM EACH OF THE ABOVE DENOTED SUBCONTRACTORS, A CONTRACT DISCLOSURE STATEMENT (PROPOSAL PAGES 24-32) AND THE REQUIRED DISCLOSURE OF RELATIONSHIPS TO COUNTY (PROPOSAL PAGES 33-34)

COMPLETE THIS FORM USING BLACK INK ONLY

2. INFORMATION FOR BIDDERS

DEPARTMENT OF PUBLIC WORKS

Division of Engineering

INFORMATION FOR BIDDERS

1. ADDENDA AND INTERPRETATION

No interpretation of the meaning of the plans, specifications or other contract documents will be made to any bidder orally. Every request for such interpretation should be in writing addressed to the Westchester County Department of Public Works, Division of Engineering, Room 512, Michaelian Office Building, White Plains, New York, and to be given consideration must be received at least five (5) days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be posted on the internet not later than three (3) days prior to the date fixed for the opening of bids. Revisions to plans or drawings requiring the issuance of additional or revised drawings will be noted on the internet with instructions how to acquire copies of such revised plans or drawings. Failure of any bidder to receive any such addendum or interpretation or any other form, instrument or document shall not relieve any bidder from any obligation under its bid as submitted. All addenda so issued shall become part of the contract documents.

A bidder's failure to request a clarification, interpretation, etc. of any portion of the plans, specifications, or contract or to point out any inconsistency therein will preclude such bidder from thereafter claiming any ambiguity, inconsistency, or error which should have been discovered by a reasonably prudent bidder and from asserting any claim for damages arising directly or indirectly therefrom.

2. VOIDED CLAUSES

Wherever in this booklet any page is stamped "VOID", only the section(s) or paragraph(s) so stamped are void. All other sections(s) and paragraph(s) remain in full force and effect.

3. PRE-BID SITE INSPECTION

Unless otherwise stated, on building construction work, bidders are free and encouraged to examine the work site during normal work hours preceding the date on which bids are to be opened. For those bidders requesting further clarification of the conditions, an appointment with the County's representative, on the eighth day (Tuesday) prior to the bid opening date, can be requested, by contacting the, Department of Public Works, Division of Engineering at (914) 995-2553.

Each bidder must inform itself fully of the conditions relating to the work to be performed. Failure to do so will not relieve a successful bidder of the obligation to furnish all material and labor necessary to carry out the provisions of the contract documents and to complete the contemplated work for the consideration set forth in its Bid.

At the time of the opening of bids each bidder will be presumed to have inspected the sites and to have read and to be thoroughly familiar with the Plans and Contract Documents (including all addenda).

4. BID SECURITY

Bid Security shall be provided in accordance with the "Notice to Contractors." Where

a Performance and Payment bond is required in the Notice to Contractors, the executed "Bid Bond and Consent of Surety" of the Proposal Pages must be submitted with the Bid when the bid is more than $100,000. The successful bidder, no matter the size of its bid, will be required to furnish a Performance and Payment Bond.

Where a Performance and Payment Bond is not specified in the Notice to Contractors, then the required Security may be furnished in the form of a Certified Check; drawn to the order of "County of Westchester, clipped to the top of the front cover and submitted with the Bid.

Certified checks submitted will be returned to all bidders submitting certified checks within three (3) days after the opening of bids unless the bidder or bidders submitting certified checks are among the two lowest bidders. At any time after the opening of bids, the second lowest bidder, if the second lowest bidder has submitted a certified check, may substitute a bid bond for the certified check by presenting the bond to the Secretary of the Board of Acquisition and Contract. This bond shall be in the form and coverage required by the County and shall be in an amount not less than the amount of the bidder's certified check. After receipt, approval and acceptance of the bond by the County, the County will forward to the bidder a County check in an amount equal to the bidder's certified check.

All certified checks submitted will be returned to the two lowest bidders within 48 hours after the successful bidder executes the required contract and furnishes the County with all necessary bonds and insurance certificates.

In the event that the successful bidder has not executed the required contract and furnished the required bonds and insurance certificates within forty-five (45) days after the opening of bids, the County, upon demand from a bidder (except for the successful bidder), will send a County check to the bidder in the amount of the bidder's certified check.

Failure of the successful bidder to execute the contract and furnish the necessary bonds and insurance certificates shall result in forfeiture of the bid security, such sum to be retained by the County as liquidated damages.

5. PERFORMANCE AND PAYMENT BOND

If required pursuant to "Notice to Contractors."

If a Performance and Payment bond is required in accordance with the "Notice to Contractors", the "Bid Bond and Consent of Surety" of the Proposal Pages must be executed by the Contractor's Surety Company and submitted with the Bid for all bids over $100,000.

Simultaneously with its delivery of the executed contract, the successful bidder shall deliver to the County an executed bond in the amount of one hundred percent of the accepted bid as security for the faithful performance of its contract and in the amount of one hundred percent for the payment of all persons performing labor or furnishing materials in connection therewith, prepared in satisfactory form and having as surety thereon such bond underwriter or surety that appears on the U.S. Treasury's listing of approved sureties (Department Circular 570), and is licensed to transact business in New York State. In the event such Surety ceases to appear on the U.S. Treasury's listing of approved sureties (Department Circular 570) or ceases to be licensed to transact business in New York State or becomes insolvent or enters liquidation proceedings, the Contractor, at its sole cost, shall furnish a replacement bond from a surety satisfactory to the County.

The form of contract and Performance and Payment Bond to be used in connection with this Contract and to become a part of the contract documents is attached in the section entitled "Sample Contract and Bond for Construction".

6. INDEMNIFICATION AGREEMENT

The Contractor agrees:

A. that except for the amount, if any, of damage contributed to, caused by or resulting from the negligence of the County, the Contractor agrees to indemnify and hold harmless the County of Westchester, its officers, employees, elected officials, and agents from and against any and all liability, damage, claims, demands, costs, judgments, fees, attorneys' fees or loss arising directly or indirectly out of the performance or failure to perform hereunder by the Contractor or third parties under the direction or control of the Contractor; and

B. to provide defense for and defend, at its sole expense, any and all claims, demands or causes of action directly or indirectly arising out of the Agreement and to bear all other costs and expenses related thereto.

7. INSURANCE REQUIREMENTS

The Contractor, upon award of the contract and throughout the term of the Agreement, shall obtain at its own cost and expense the required insurance as delineated below from insurance companies licensed in the State of New York, carrying a Best's financial rating of A or better. Contractor shall provide evidence of such insurance to the County of Westchester ("County"), either by providing a copy of policies and/or certificates as may be required and approved by the Director of Risk Management of the County ("Director"). The policies or certificates thereof shall provide that ten (10) days prior to cancellation or material change in the policy, notices of same shall be given to the Board of Acquisition and Contract of the County of Westchester by registered mail, return receipt requested, for all of the following stated insurance policies, with a copy also sent to the Director of Risk Management of the County. All notices shall name the Contractor and identify the Contract Number.

If at any time any of the policies required herein shall be or become unsatisfactory to the Director, as to form or substance, or if a company issuing any such policy shall be or become unsatisfactory to the Director, the Contractor shall upon notice to that effect from the County, promptly obtain a new policy, and submit the policy or the certificate as requested by the Director to the Office of Risk Management of the County for approval by the Director. Upon failure of the Contractor to furnish, deliver and maintain such insurance, the Agreement, at the election of the County, may be declared suspended, discontinued or terminated.

Failure of the Contractor to take out, maintain, or the taking out or maintenance of any required insurance, shall not relieve the Contractor from any liability under the Agreement, nor shall the insurance requirements be construed to conflict with or otherwise limit the contractual obligations of the Contractor concerning indemnification.

All property losses shall be made payable to the "County of Westchester" and adjusted with the appropriate County personnel.

In the event that claims, for which the County may be liable, in excess of the insured amounts provided herein are filed by reason of Contractor's negligent acts or omissions under the

agreement or by virtue of the provisions of the labor law or other statute or any other reason, the amount of excess of such claims or any portion thereof, may be withheld from payment due or to become due the Contractor until such time as the Contractor shall furnish such additional security covering such claims in form satisfactory to the Director.

In the event of any loss, if the Contractor maintains broader coverage and/or higher limits than the minimums identified herein, the County shall be entitled to the broader coverage and/or higher limits maintained by the Contractor. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to the County.

The Contractor shall provide proof of the following coverage. (Other coverage may be required by the County of Westchester based on specific needs. If such other coverages are required for a specific contract, those coverages will be described in the "Special Clauses" of the contract specifications):

a) Workers' Compensation and Employer's Liability. Certificate form C-105.2 or State Fund Insurance Company form U-26.3 is required for proof of compliance with the New York State Workers' Compensation Law. State Workers' Compensation Board form DB-120.1 is required for proof of compliance with the New York State Disability Benefits Law. Location of operation shall be "All locations in Westchester County, New York."

Where an applicant claims to not be required to carry either a Workers' Compensation Policy or Disability Benefits Policy, or both, the employer must complete NYS form CE-200, available to download at: http://www.wcb.ny.gov.

If the employer is self-insured for Workers' Compensation, he/she should present a certificate from the New York State Worker's Compensation Board evidencing that fact (Either SI-12, Certificate of Workers' Compensation Self-Insurance, or GSI-105.2, Certificate of Participation in Workers' Compensation Group Self-Insurance).

b) Commercial General Liability Insurance with a combined single limit of $1,000,000 (c.s.1) per occurrence and a $2,000,000 aggregate limit naming the "County of Westchester" as an additional insured on a primary and non-contributory basis. This insurance shall include the following coverages:
   i. Premises - Operations.
   ii. Broad Form Contractual.
   iii. Independent Contractor and Sub-Contractor.
   iv. Products and Completed Operations.

NOTE: Additional insured status shall be provided by standard or other endorsement that extends coverage to the County of Westchester for both on-going and completed operations.

All Contracts involving the use of explosives, demolition and/or underground work shall provide proof that XCU is covered.

c) Commercial Umbrella/Excess Insurance: $2,000,000 each Occurrence and Aggregate naming the "County of Westchester" as additional insured, written on a "follow the form" basis.

d) Owners Protective Liability Policy naming the County as insured, with a minimum limit of liability per occurrence of $3,000,000 (where applicable, or as determined by the Director, Risk Management)

e) Automobile Liability Insurance with a minimum limit of liability per occurrence of $1,000,000 for bodily injury and a minimum limit of $100,000 per occurrence for property damage or a

combined single limit of $1,000,000 unless otherwise indicated in the contract specifications. This insurance shall include for bodily injury and property damage the following coverages and name the "County of Westchester" as additional insured:

i. Owned automobiles.
ii. Hired automobiles.
iii. Non-owned automobiles.

f) Construction Insurance: For the construction, renovation or repair of bridges, viaducts or similar structures, the Contractor at its own cost and expense shall provide and maintain a "Bridge Builder's Risk Form, All Risk Insurance Contract," with flat premium endorsement, until the construction contract is accepted by the Board of Acquisition and Contract of the County of Westchester. The coverage shall be written for 100% of the completed value, covering the Contractor and County of Westchester as the insureds. The Contractor shall provide the original and duplicate policy to the County (unless the County shall accept, in lieu thereof, all contained endorsements including all applicable provisions and coverages).

For the construction of (a) new buildings and (b) for additions or repairs of existing buildings or structures, the Contractor at its own cost and expense shall provide and maintain a "Builder's Risk Form, All Risk Insurance Contract," with flat premium endorsement, until the construction contract is accepted by the Board of Acquisition and Contract of the County of Westchester. The coverage shall be written for 100% of the completed value, covering the Contractor and County of Westchester as the insureds. The Contractor shall provide the original and duplicate policy to the County (unless the County shall accept, in lieu thereof, all contained endorsements including all applicable provisions and coverages).

All policies of the Contractor shall be endorsed to contain the following clauses:

(a) Insurers shall have no right to recovery or subrogation against the County (including its employees and other agents and agencies), it being the intention of the parties that the insurance policies so effected shall protect both parties and be primary coverage for any and all losses covered by the above-described insurance.

(b) The clause "other insurance provisions" in a policy in which the County is named as an insured, shall not apply to the County.

(c) The insurance companies issuing the policy or policies shall have no recourse against the County (including its agents and agencies as aforesaid) for payment of any premiums or for assessments under any form of policy.

(d) Any and all deductibles in the above described insurance policies shall be assumed by and be for the account of, and at the sole risk of, the Contractor.

THIS SECTION INTENTIONALLY LEFT BLANK

8. PREVAILING WAGE RATES AND SUPPLEMENTS

A. Wages to be Paid and Supplements to be Provided

Each laborer, workman or mechanic employed by the Contractor(s), Sub-contractor(s) or other person(s) doing or contracting to do the whole or part of the work contemplated by this Contract, shall be paid the prevailing wages and provide the supplements (including but not limited to health, welfare and pension benefits) as required by Article 8 (Section 220-223) and Article 9 (230-239) of the New York State Labor Law.

B. Schedule of Hourly Rates/Supplements

The "Schedule of Hourly Rates and Supplements" shows the prevailing hourly rates of wages to be paid and supplements to be provided. It is the County's preference that such supplements shall be paid to a Federally qualified Pension, Health and Welfare program and New York State Registered Apprentice Training Program.

Classifications not appearing on the rate sheet can be used only with the consent of the Commissioner of Public Works and then the rate to be paid will be given by the Commissioner of Public Works after advising with the State Department of Labor.

C. Grounds for Cancellation of Contract

In the event of a failure, to pay the prevailing wages and provide the supplements in accordance with the New York State Labor Law, and as described in this Contract, it shall be considered a material breach. For the breach or violation of this provision, without limiting any other rights or remedies to which the County or any individual may be entitled or any civil or criminal penalty for which any violator may be liable, the County shall have the right, in its discretion, to terminate this agreement immediately upon notice. In such event, the Contractor(s), Sub-Contractor(s), et al shall be liable to the County for any additional costs incurred by the County in the completion of the project.

In addition to any other remedies available to the County and irrespective of any applicable penalties pursuant to law, the County may deduct from the amount payable to the Contractor under this contract five hundred ($500.00) dollars as reimbursement for the costs it incurs in investigating any violation of Section 220 of the Labor Law.

D. Records to be kept on Site

The Contractor(s), Sub-contractor(s), et al. shall certify their payrolls and keep them on site and available, in addition to the following informative records:

1) Record of hours worked by each workman, laborer and mechanic on each day;

2) Record of days worked each week by each workman, laborer and mechanic;

3) Schedule of occupation or occupations at which each workman, laborer and mechanic on the project is employed during each work day and week;

4) Schedule of hourly wage rates paid to each workman, laborer and mechanic for each occupation.

5) A statement or declaration signed by each workman, laborer and mechanic attesting that they have been provided with a written notice, informing them of the prevailing wage rates and supplements requirement for this contract.

E. Responsibility of the Contractor, Sub-Contractor, et al.

The Contractor(s), Sub-Contractor(s), et al. will display the posters in a conspicuous location at the site and distribute the wallet cards to the employees. These posters and wallet cards will inform the employees that they are entitled to receive the prevailing wages and supplements as determined by the Department of Labor and will list the

Department of Labor's Public Work field offices, with phone numbers for individuals to call if they believe their rights are being violated.

F. Pay for a Legal Day's Work & Use of Apprentices

The wages to be paid for a legal day's work, as hereinbefore defined, to laborers, workmen or mechanics upon such public works, shall be not less than the prevailing rate of wages as hereinafter defined. Serving laborers, helpers, assistants and apprentices shall not be classified as common labor and shall be paid not less than the prevailing rate of wages as hereinafter defined. No employee shall be deemed to be an apprentice unless he is individually registered in an apprenticeship program which is duly registered with the Industrial Commissioner in conformity with the provision of Article 23 of the Labor Law. The wages to be paid for a legal day's work, as hereinbefore defined, to laborers, workmen or mechanics upon any material to be used upon or in connection therewith shall be not less than the prevailing rate for a day's work in the same trade or occupation in the locality within the state where such public work on, about or in connection with which such labor is performed in its final or completed form is to be situated, erected or used and shall be paid in cash; provided, however, that an employer may pay his employees by check upon a Certificate of the Industrial Commissioner to be issued only after a hearing upon the application to pay by check, which hearing shall be with notice of at least five days to be served personally or by mail on all interested persons, or if not served as aforesaid, then to be published in a manner directed by the Industrial Commissioner, which shall afford interested persons the opportunity to appear and to be heard at such hearing, and after proof has been furnished satisfactorily to the Industrial Commissioner of the employer's financial responsibility and the employer gives assurance that such checks may be cashed by employees without difficulty and for the full amount for which they are drawn. Such Contracts shall contain a provision that each laborer, workman or mechanic, employed by such Contractor, Subcontractor or other person about or upon such public works, shall be paid the wages herein provided.

G. Fiscal Officer's Duty to Determine Schedule of Wages

It shall be the duty of the fiscal officer (the "New York State Commissioner of Labor"), to ascertain and determine the schedule of wages to be paid workmen, laborers and mechanics on each such public work, prior to the time of the advertisement for bids, and such schedule of wages shall be annexed to and form a part of the specifications for the work. Such fiscal officer shall file with the department having jurisdiction such schedule of wages to the time of the commencement of the advertisement for bids on all public works proposed to be constructed. The term "Contract" as used in this subdivision also shall include reconstruction and repair of any such public work.

Where Contracts are not awarded within ninety days of the date of the establishment of the prevailing rate of wages by the fiscal officer, the department of jurisdiction shall request of the fiscal officer a redetermination of a schedule of wages.

H. Penalty for Payment of Less than Prevailing Wages

Any person or corporation that willfully pays after entering into such Contract, less than such stipulated wage scale as established by the fiscal officer shall be guilty of a

misdemeanor and upon conviction shall be punished for such first offense by a fine of five hundred dollars or by imprisonment for not more than thirty days, or both fine and imprisonment; for a second offense by a fine of one thousand dollars, and in addition thereto the Contract on which the violation has occurred shall be forfeited and no such person or corporation shall be entitled to receive any sum nor shall any officer, agent, or employee of the state, municipal corporation or commission or board appointed pursuant to law pay the same or authorize its payment from the funds under his charge or control to any person or corporation for work done upon any Contract, on which the Contractor has been convicted for a second offense in violation of the provisions of this section.

9. LABOR AND COMPLIANCE WITH LABOR LAW

A. Preference for Westchester Residents

The Contractor agrees that in the performance of the work under this Contract he will give preference, and so far as legally possible, to employ citizens and residents of Westchester County.

B. Certifications To Be Filed

It is agreed that, in accordance with Section 220-d of the Labor Law as amended before final payment by or on behalf of the County for any sum due on account of a Contract for a public improvement, the Contractor and each and every Subcontractor of the Contractor or a Subcontractor is required to file a statement in writing in form satisfactory to the Commissioner of Finance certifying to the amounts then due and owing from such Contractor or Subcontractor filing such statement to or on behalf of any and all laborers for daily or weekly wages or supplements on account of labor performed upon the work under the Contract, setting forth therein the names of the persons whose wages or supplements are unpaid and the amount due to each or on behalf of each respectively, which statement so to be filed shall be verified by the oath of the Contractor or Subcontractor as the case may be that he has read such statement subscribed by him and knows the contents thereof, and that the same is true to his own knowledge.

C. Retention of Funds

It is further agreed that in accordance with Section 220b of the Labor Law, as amended:

1) In case any interested person shall have previously filed a protest in writing objecting to the payment to any Contractor or Subcontractor to the extent of the amount or amounts due or become due to him/her for daily or weekly wages or supplements for labor performed on the public improvement for which such Contract was entered into, or if for any other reason it may be deemed advisable, the Commissioner of Finance may deduct from the whole amount of any payment on account thereof the sum or sums admitted by any Contractor or Subcontractor in such statement or statements so filed to be due and owing by him on account of labor performed on such public improvement before making payment of the amount certified for payment in any estimate or voucher, and may withhold the amount so deducted for the benefit of the laborers, workmen or mechanics whose

wages or supplements are unpaid or not provided, as the case may be, as shown by the verified statements filed by any Contractor or Subcontractor, and may pay directly to any person the amount or amounts shown to be due to him or his duly authorized collective bargaining labor organization, as the case may be, for such wages or supplements by the statements filed as hereinbefore required, thereby discharging the obligation of the Contractor or Subcontractor to the person or his duly authorized collective bargaining labor organization receiving such payment to the extent of the amount thereof, or

2) When any interested person shall file a written complaint with the fiscal officer as defined in section 220-b of the Labor Law, alleging unpaid wages or supplements due for labor performed on a public improvement for which a Contract has been entered into, and said labor is alleged to have been performed within the two year period immediately preceding the date of the filing of said complaint, or if, on the fiscal officer's own initiative, unpaid wages or supplements appear to be due, the fiscal officer shall immediately so notify the financial officer of the civil division interested, or, if there are insufficient moneys still due to the Contractor or Subcontractor to satisfy said wages and supplements, including interest and penalty, the financial officer of another civil division which has entered or subsequently enters into a public improvement contract with the Contractor or Subcontractor, who shall withhold from any payment due or earned by the Contractor or Subcontractor executing said public improvement, sufficient moneys to satisfy said wages and supplements, including interest at the rate provided herein, and any civil penalty that may be assessed as provided herein, pending a final determination. The Commissioner of Finance shall immediately confirm in writing to the fiscal officer the amount of money withheld.

3) Moneys withheld pursuant to this section shall be held by the Commissioner of Finance for the sole and exclusive benefit of the workers employed on said public improvement and for payment of any civil penalty that may be assessed as provided herein and shall not be used for any other purpose except upon court order. Any person, partnership, association, corporation or governmental body who files a lien or commences a judicial proceeding with respect to any moneys withheld pursuant to this section shall notify the fiscal officer in writing of the lien or claim on or before the date of filing of the lien or commencement of the judicial proceeding. In any proceeding to obtain moneys withheld pursuant to this section by any person, partnership, association, corporation or governmental body, the Commissioner of Labor shall have the right to appear and be heard.

4) The fiscal officer shall then cause an investigation to be made to determine whether any amounts are due to the laborers, workmen or mechanics, or on their respective behalves, on such public improvement, for labor performed after the commencement of the three-year period immediately preceding the filing of the complaint or the commencement of the investigation on his own initiative, as the case may be, and shall order a hearing therein at a time and place to be specified and shall give notice thereof, together with a copy of such complaint, or a statement of the facts disclosed upon such investigation, which notice shall be served personally or by mail on all interested persons, including the person complained

against and upon the financial officer of the civil division; such person complained against shall have an opportunity to be heard in respect to the matters complained of, at the time and place specified in such notice, which time shall be not less than five days from the service of said notice. The fiscal officer in such an investigation shall be deemed to be acting in a judicial capacity and shall have the rights to issue subpoenas, administer oaths and examine witnesses. The enforcement of a subpoena issued under this section shall be regulated by the Civil Practice Law and Rules. Such investigation and hearing shall be expeditiously conducted, and upon such hearing and investigation, the fiscal officer shall determine the issues raised thereon and shall make and file an order in his office stating such determination and forthwith serve a copy of such order, either personally or by mail, together with notice of filing, upon the parties to such proceedings, and if the fiscal officer be the Comptroller, upon the Commissioner of the Department of Labor. Such order shall direct payment of wages or supplements found to be due, including interest at the rate of interest then in effect as prescribed by the Superintendent of Banks pursuant to Section fourteen (a) of the Banking law per annum from the date of the underpayment to the date of payment.

5) In addition to directing payment of wages or supplements, including interest found to be due, the order of the fiscal officer may direct payment of a further sum as a civil penalty in an amount not exceeding twenty-five percent of the total amount found to be due. In assessing the amount of the penalty, due consideration shall be given to the size of the employer's business, the good faith of the employer, the gravity of the violation, the history of previous violations of the employer or any successor or substantially-owned affiliated entity or any of the partners if the Contractor or Subcontractor is a partnership or any of the five largest shareholders of the Contractor or Subcontractor, as determined by the fiscal officer, and any officer of the Contractor or Subcontractor who knowingly participated in the violation of this article, and the failure to comply with record keeping or other non-wage requirements. Upon the fiscal officer's determination of the penalty, where the fiscal officer is the Commissioner of the Department of Labor, the penalty shall be paid to said Commissioner for deposit in the State Treasury.

6) Upon the entry and service of such order, the Commissioner of Finance shall pay to the claimant, from the moneys due to the Contractor or Subcontractor, the amount of the claim as determined by the fiscal officer and the amount of the civil penalty, if any, shall be paid as provided herein, provided that no proceeding pursuant to Article Seventy-Eight of the Civil Practice Law and Rules for review of said order is commenced by any party aggrieved thereby within thirty days from the date of said order was filed in the office of the fiscal officer. Said proceeding shall be directly in the appellate division of the Supreme Court. Where the fiscal officer is the Commissioner of the Department of Labor, the civil penalty shall be paid to said Commissioner for deposit in the State Treasury. In the event that such a proceeding for review is instituted, moneys sufficient to satisfy the claim and civil penalty shall be set aside by the Commissioner of Finance, subject to the order of the Court.

7) When final determination has been made and such determination is in favor of the complainant, said complainant may in addition to any other remedy provided by this article, institute an action in any Court of appropriate jurisdiction against the person or corporation found violating this article, any substantially-owned affiliated entity or any successor of the Contractor or Subcontractor, any officer of the Contractor or Subcontractor who knowingly participated in the violation of this article, and any of the partners if the Contractor or Subcontractor is a partnership or any of the five largest shareholders of the Contractor or Subcontractor, as determined by the fiscal officer, for the recovery of the difference between the sum, if any, actually paid to him by the Commissioner of Finance pursuant to said order and the amount found to be due him as determined by said order. Such action must be commenced, within three years from the date of the filing of said order, or if the said order is reviewed in a proceeding pursuant to Article Seventy-eight of the Civil Practice Law and Rules, within three years after the termination of such review proceeding.

8) When two final determinations have been rendered against a Contractor, Subcontractor, successor, or any substantially owned affiliated entity of the Contractor or Subcontractor, any of the partners if the Contractor or Subcontractor is a partnership, any officer of the Contractor or Subcontractor who knowingly participated in the violation of this article, any of the five largest shareholders of the Contractor or Subcontractor or any successor within any consecutive six-year period determining that such Contractor, Subcontractor, successor, or any substantially-owned affiliated entity of the Contractor or Subcontractor, any of the partners or any of the five largest shareholders of the Contractor or Subcontractor, any officer of the Contractor or Subcontractor who knowingly participated in the violation of this article has willfully failed to pay the prevailing rate of wages or to provide supplements in accordance with this article, whether such failures were concurrent or consecutive and whether or not such final determinations concerning separate public work projects are rendered simultaneously, such Contractor, Subcontractor, successor, or any substantially-owned affiliated entity of the Contractor or Subcontractor, any of the partners if the Contractor or Subcontractor is a partnership or any of the five largest shareholders of the Contractor or Subcontractor, any officer of the Contractor or Subcontractor who knowingly participated in the violation of this article shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with the State, any municipal corporation or public body for a period of five years from the second final determination, provided, however, that where any such final determination involves the falsification of payroll records or the kickback of wages or supplements, the Contractor, Subcontractor, successor, or any substantially-owned affiliated entity of the Contractor or Subcontractor, any partner if the Contractor or Subcontractor is a partnership or any of the five largest shareholders of the Contractor or Subcontractor, any officer of the Contractor or Subcontractor who knowingly participated in the violation of this article shall be ineligible to submit a bid on or be awarded any public work contract with the State, any municipal corporation or public body for a period of five years from the first final determination.

9) Nothing in this subdivision shall be construed as affecting any provision of any other law or regulation relating to the awarding of public contracts.

Pursuant to Section 220-C of the Labor law, any Contractor or Subcontractor who shall upon his oath verify any statement required to be filed herein, which is known by him to be false, shall be guilty of perjury and punishable as provided by the Penal Law.

10. CONTRACTOR'S REPORT OF EMPLOYMENT AND WEEKLY AFFIDAVIT

Each week the Contractor shall furnish to the Commissioner of Public Works the "Contractor's Report Of Employment And Weekly Affidavit" of the Sample Forms.

11. LAWS/REGULATIONS AND APPROPRIATIONS

A. The Contractor shall, at its own cost and expense, comply with all provisions of the Labor Law (i.e. prevailing rate of wages and supplements), Lien Law, Workmen's Compensation Law and all other laws and ordinances affecting this contract or order, either Federal, State or local.

B. It is recognized and understood by the Parties that when this Agreement is subject to future appropriation by the Westchester County Board of Legislators for funds not presently appropriated to pay for this Agreement; the County shall have no liability under this agreement beyond the funds, if any, that are appropriated and available for payment of the amounts due under this Agreement. The Parties understand and intend that the obligation of the County to pay the amounts due hereunder shall constitute a current expense of the County and shall not in any way be construed to be a debt of the County in contravention of any applicable constitutional or statutory limitations or requirements concerning the creation of indebtedness by the County, nor shall anything contained in this Agreement constitute a pledge of the general tax revenues, funds or monies of the County. The County shall pay amounts due under this Agreement exclusively from legally available funds appropriated for this purpose. Notwithstanding the foregoing, the County will do all things lawfully within its power to obtain, maintain, and properly request and pursue funds from which payments under this Agreement may be made, including: (i) the County Executive making provisions for such payments to the extent necessary in the annual budget submitted to the Board of Legislators for the purpose of obtaining funding; and (ii) using its reasonable efforts to have such portion of the budget approved.

12. REFUSAL TO ANSWER QUESTIONS

It is understood and agreed by the Contractor that he/she bears an affirmative obligation to answer questions specifically or directly relating to this agreement before any official, board or agency authorized or empowered to inquire into such matters. This section shall not be construed as barring the Contractor, its directors, officers or employees from exercising their constitutional privilege against self-incrimination.

The foregoing, however, shall not be construed as limiting the rights and remedies of the County in the event of such refusal, and when such body or agency is wholly civil in nature,

failure or refusal to fully cooperate with and diligently answer the inquiries of such official, board or agency may constitute grounds for the termination of this agreement and/or the exercise of any and all other rights or remedies which the County may have by reason of such failure or refusal.

Any and all contracts made with the State, the County of Westchester, or any public department, agency or official thereof, since July 1, 1959 by such person and by any firm, partnership or corporation of which he is a member, partner, director or officer, may be canceled or terminated by the County of Westchester, without incurring any penalty or damages on account of such cancellation or termination, but any monies owing pursuant to said transaction or contract prior to the cancellation and termination, shall be paid.

The successful bidder will be required to make all books and records concerning this contract available during business hours, upon reasonable notice, to duly authorized County personnel for the purpose of ascertaining compliance and/or performance of all provisions of this contract. This provision shall survive the termination of this agreement and for a period of six (6) years thereafter.

13. BID REQUIREMENTS

The Bid must be made on the "Proposal Pages" included in this specification or as provided with an addendum. All blank spaces on said Proposal Pages must be filled in and no change shall be made in the phraseology or in the items as contained therein.

Any bid which fails to name a price per unit of measurement for each of the items for which quantities are given, may be held to be informal and rejected. Bids submitted on Proposal Pages that contain any omissions, alterations, additions or items not called for in the bid documents, or that are illegible, unbalanced, conditional, incomplete or contain irregularities of any kind, may be rejected as informal. If the various parts of the work have been divided into classes and/or items to enable the bidder to bid for different portions of the work in accordance with its estimate of their costs, in the event of any increase or decrease in the quantity will be paid for at the price bid for that particular item. The sum of the amounts for each class or item, obtained by multiplying the approximate quantity by the unit price, shall constitute the total sum bid.

In the event of a discrepancy between the written bid amount and the numerical bid amount, the written amount will take precedence and be controlling as to the amount of the Bid. Any such discrepancy shall be corrected as set forth in Article "Correction Of Errors" of the Information for Bidders.

14. MISCELLANEOUS ADDITIONAL WORK (ITEM W-800)

A. Description - Under this item each Contractor shall furnish all labor, material and equipment required to accomplish miscellaneous additional work:

1) Necessitated by encountering during the course of the work field conditions of a nature not determinable during design; or

2) For which no unit prices are applicable.

B. Method of Measurement - Only that miscellaneous additional work shall be performed by the Contractor and will be paid for by the County, which has been authorized by the Commissioner or the Construction Administrator in writing, prior to its commencement.

C. Article "Increase or Decrease of Quantities: Elimination of Items" of the Information for Bidders, will still apply relative to the percentage of the total awarded contract price that the work under the contract may be increased or decreased.

D. Payment - The total amount paid to the Contractor will be determined in strict accordance with the provisions of Article "Extra Work: Increased Compensation/ Decreased Work: Credit to the Owner" of the General Clauses, and such payment will include only that overhead and profit that is applicable to the work performed under this item.

E. Each Contractor shall include in its total bid the lump sum printed in the Proposal and any bid other than the specified amount will be considered informal.

15. CORRECTION OF ERRORS

Relative to dollar bid items and the required computations as submitted and performed by bidders on the proposal sheets, if there are any inconsistencies derived in multiplying unit bid prices by the stated quantities, the Commissioner reserves the right to reconcile the unit bid prices or the products of the unit bid prices and the stated quantities, when in the Commissioner's professional opinion such reconciliation(s) would concur with the apparent intent of a bidder and the Commissioner's estimated values of the respective bid items of the proposed contract work. In addition to the foregoing, the Commissioner reserves the right to correct all mathematical errors in additions or subtractions.

16. SHOWN QUANTITIES

All bids shall be submitted upon the following express conditions, which shall apply to and become a part of every bid received. The Bidders accept the quantities shown on the Proposal Pages opposite items of the work for which unit prices are to be bid as being approximate estimated quantities. Bidders shall satisfy themselves by personal examination of the location of the proposed work and surroundings thereof, and by such other means as they may prefer, as to the scope of the work and the accuracy of the approximate estimated quantities; and shall not at any time after submission of their bids dispute such approximate estimated quantities nor assert that there was any misrepresentation by the County or any misunderstanding by the Contractor in regard to the quantity or kind of materials to be furnished, or work to be done.

17. QUALIFICATION OF BIDDERS

The County may make such investigation as it deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish all information and data for this purpose as may be requested. The County reserves the right to reject any bid if the evidence submitted by, or the investigation of such bidder fails to satisfy the County, in the County's sole discretion, that it is properly qualified to carry out the obligations of the contract and to complete the contemplated work.

18. REQUIRED EXPERIENCE

The County requires that each contractor possess not less than five (5) year's experience in performing work substantially similar in scope and size to the work for which it is bidding. The contractor agrees that upon request of the County the contractor will furnish a detailed statement of each project that it has performed during the most recent five (5) years (including but not limited to the name and address of the project, the name of the awarding entity/owner, the name of the awarding entity's/owner's representative, a current telephone number where that representative can be reached, the description of the project, general scope of the contractor's work, contract price, dates of performance, whether the contract was terminated for cause or convenience, whether the contract was completed and whether liquidated damages were assessed against the contractor [and if so, provide a written explanation]). The County reserves the right to require additional information as it deems appropriate concerning the history of the contractor's performance of each such contract. The final determination of whether the contractor possesses the requisite experience rests in the sole discretion of the County.

19. INCREASE OR DECREASE OF QUANTITIES: ELIMINATION OF ITEMS

In entering into this contract, the Contractor agrees that quantities shown on the Proposal Pages opposite items of the work for which unit prices have been requested are approximate estimated quantities, and that during the progress of the work the County may find it advisable and shall have the right to omit portions of the work, and to increase or decrease the shown approximate estimated quantities, or the scope of the whole work; and that the County reserves the right to add to or take from the total amount of the work up to a limit of thirty percent of the total amount of the contract based upon the executed contract price for all the specified work.

The Contractor shall make no claim for anticipated profits or loss of profits, because of any difference between the quantities of the various classes of work actually done, or of the materials actually furnished, and the original specified scope of work and the shown approximate estimated quantities.

The aforesaid thirty- percent pertains to the total amount of the contract and not to any individual item. Individual items may be increased or decreased any amount or may be eliminated entirely if so ordered by the Commissioner, excepting that the total amount of the contract as adjusted shall not result in a net increase or decrease of more than thirty percent except by mutual agreement between both parties thereto.

The Contractor waives all claims of any nature due to a misunderstanding of the location, character, or other conditions surrounding the work or of the shown approximate estimated quantities of items of the work.

20. BREAKDOWN COST OF LUMP SUM ITEMS AND CONTRACTS

After award of the contract and prior to actual start of the work, the successful bidder shall submit an itemized schedule of its estimated costs of lump sum items and or lump sum total contract work, for approval by the County. The schedule shall be submitted as an outline series with minor subdivisions, in accordance with the directives of the County. As part of

this Schedule, the Contractor will be required to include a sum sufficient, as determined in the County's sole discretion, for the preparation and submission of approved final "As-builts", record drawings, guarantees, warranties, and operations and maintenance manuals.

21. ENGINEERING CHARGES

In addition to any and all other remedies available to the County when the work embraced in the contract is not completed on or before the date specified herein, engineering and inspection expenses incurred by the County of Westchester upon the work from the completion date originally fixed in the contract to the final date of completion of the work may be charged to the Contractor and be deducted from monies due the Contractor. Consideration of any extra work or supplemental contract work added to the original contract, as well as extenuating circumstances beyond the control of the Contractor, will be given due consideration by the County before assessing engineering and inspection charges against the Contractor. Such charges will be assessed, however, in cases where in the opinion of the Commissioner, the Contractor has delayed the work.

22. ESTIMATES AND PAYMENTS

As the work progresses but not more often than once a month and then on such days as the Construction Administrator may fix, the Contractor will submit a requisition in writing of the amount and value of the work performed and the materials and equipment provided to the date of the requisition, less any amount previously paid to the Contractor. The Contractor must complete at least ten (10%) percent of the work before submitting any claims for mobilization. From each requisition, the County will retain five percent (5%) plus one hundred fifty percent (150%) of the amount necessary to satisfy any claims, liens or judgments against the Contractor that have not been suitably discharged. The Commissioner will thereupon cause the balance of the requisition therein to be paid to the Contractor. In lieu of all or part of the cash retainage the County shall only accept bonds or notes of United States of America, New York State or political subdivisions thereof. As a condition to the making of any progress payment as set forth in this paragraph, the County, in its sole discretion may require the Contractor to submit such document as may be reasonably required to establish that the Contractor (and its subcontractor(s)) have timely and properly paid their respective subcontractor(s) and materialmen of whatever tier.

VENDOR DIRECT PAYMENT: All payments made by the County to the Contractor will be made by electronic funds transfer ("EFT") pursuant to the County's Vendor Direct program. The Contractor is required to complete the Vendor Direct Payment Authorization Form, which is located in the Forms Section on page 11 and 12. Payments will be automatically credited to the Contractor's designated bank account at the Contractor's financial institution. Payments are anticipated to be deposited two business days after the voucher/invoice is processed for payment. Saturdays, Sundays, and legal holidays are not considered business days. Under the Vendor Direct program you will receive an e-mail notification two days prior to the day the payment will be credited to your designated account. The e-mail notification will come in the form of a remittance advice with the same information that currently appears on County check stubs and will contain the date that the funds will be credited to your account. If there is a discrepancy in the amount received please contact

your Westchester County representative as you would have in the past if there were a discrepancy in a check.

In the unlikely event that you do not receive the money in your designated bank account on the date indicated in the e-mail, please contact the Westchester County Accounts Payable Department at 914-995-3748. Whenever you change your bank or change or close your account a new Vendor Direct Payment Authorization Form must be submitted. Please contact the Westchester County Accounts Payable Department at 914-995-3748 and a new form will be e-mailed to you. When completing the payment authorization form you must either supply a voided check or have it signed by a bank official to ensure the authenticity of the account being set up to receive your payments. Failure to return the completed authorization form prior to award of the contract may result in the bid being considered non-responsive and the bid may be rejected.

When the work or major portion thereof, as contemplated by the terms of the contract (see Substantial Completion Payment and Final Payment later in this article), are substantially completed in the judgment of the Commissioner, the Contractor shall submit a requisition for the remainder of the contract balance. An amount equal to two (2) times the value of the remaining items to be completed plus one hundred fifty percent (150%) of the amount that the Commissioner deems necessary to satisfy to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged shall be deducted from the requisition. As the remaining items of work are satisfactorily completed or corrected, the County will, upon receipt of a requisition, pay for these items less one hundred fifty percent (150%) of the amount necessary to satisfy any claims, liens or judgments.

Contractor agrees, in the event of any withdrawal by the contractor of amounts retained from payments to the contractor pursuant to the terms hereof, that notwithstanding any contrary interpretation of Section 106 of the New York General Municipal Law, the contractor will be obliged to maintain the market value of securities deposited in an amount equal to the amount withdrawn pursuant to said Section 106. The Contractor will, within five (5) days of demand therefore by the fiscal officer of the County, deposit with such fiscal officer cash, or securities of the kind provided in Section 106, of a market value sufficient to maintain the market value of all securities on deposit at a level equal (as of the date such notice of the fiscal officer is given to the contractor) to the amount which the County shall be entitled to retain from payments to the contractor pursuant to the terms of the contract.

All estimates will be made for actual quantities for work performed and materials and equipment incorporated in the work as determined by the measurements of the Engineer, and this determination shall be accepted as final, conclusive and binding upon the Contractor. All estimates will be subject to correction in any succeeding estimate.

Payment will be made for materials pertinent to the project which have been delivered to the site or off-site by the Contractor and/or Subcontractor and suitably stored and secured in first-class condition as required by the Construction Administrator. Payment may be limited to materials in short and/or critical supply and materials specially fabricated for the project, as defined by the contract. Payment will be made only upon the written request of the contractor. The Contractor must submit certified copies of the manufacturer's or vendor's invoices or statements establishing the true purchase value of the material or equipment; freight bills, release of liens and certificate of insurance covering all equipment and materials. Then the County will include in the following monthly payment an amount not to

exceed the lesser of the bid breakdown or the total purchase price of the stored equipment and materials less retainage provided that such equipment and materials are suitable for their intended use.

The Contractor shall be responsible for safeguarding stored equipment and materials against loss or damage of any nature whatsoever, shall retain title until incorporated into the work and acceptance by the County and in case of loss or damage, the Contractor shall replace such lost or damaged equipment and materials at no cost to the County.

After receipt of payment, the Contractor shall not remove from the site equipment and materials for which such payment was made without written authorization from the Commissioner.

No major equipment item shall be brought to the site until the following conditions are met:

1) The County must have received the manufacture's recommendations for on-site storage in writing.

2) The structure in which the equipment is to be installed is roofed (roofing must be watertight) and has such protection of doorways, windows, and other openings that will provide reasonable protection from the weather.

3) Prior to the County making a Partial Payment on a major equipment item the following conditions must be met:
   a. The Contractor must certify to the County, in writing, that the equipment has been properly stored.
   b. The Shop Drawings must be approved and the draft Operation and Maintenance Manuals must have been submitted.

The Contractor shall furnish to the Construction Administrator, prior to the making up of any Partial or Final Estimate, a copy of its and its Subcontractors' weekly payrolls for each and every preceding payroll period. The payroll submitted shall be a certified true copy and shall contain full information including but not limited to the number of hours worked, rate, classification and total sum paid each employee charged to or working on the job. With all except the first estimate, the Contractor shall furnish to the Construction Administrator a sworn statement listing all unpaid bills and liabilities incurred under the Contract.

A. Substantial Completion Payment

1) Within thirty (30) days after receiving written notice from the Contractor of substantial completion of the work under this Agreement, the Commissioner will cause an inspection to be made of the work done under this contract. If, upon such inspection, the Engineer determines that the work is substantially complete, a Substantial Completion Payment to the Contractor for the work done under this Contract, less any and all deductions authorized to be made by the Commissioner under this contract or by law, will be issued.

2) Such a Payment shall be considered a Partial and not a Final Payment.

3) As a condition precedent to receiving payment therefore, the Contractor must have received County approval of all Shop Drawing submittals, the Operation and Maintenance Manuals, and As-Built Drawing(s). Together with its application for substantial completion payment the Contractor shall also deliver to the

Construction Administrator a verified statement certifying that all claims or liabilities arising from the completed work, including all charges for Extra Work, Change Orders, additional time, damages or credits (collectively referred to as "claims") have been presented to the County. All such claims shall be described in sufficient detail so as to be easily identified. The Contractor's failure to submit the verified statement shall constitute a full and final waiver of all claims against the County from the beginning of the project through the date of substantial completion as established by the County. The presentation of the verified statement to the County shall not constitute an acknowledgement by the County that any such claim is valid. The County expressly reserves its right to assert that any such claim(s) is waived or precluded by reason of other provisions of the contract documents. Only claims particularly identified on the Contractor's verified statement shall be preserved; all other claims whatever nature shall be deemed waived and released. It shall also submit proof of title of the materials and equipment covered by the contract. The Contractor shall also, prior to the issuance of said Substantial Completion Payment, supply to the County affidavits and certificates for labor, material and equipment (where applicable).

B. Final Payment

1) Within ten (10) days after receiving written notice from the Contractor of completion of all the work, the Engineer will make a final inspection. If upon inspection the Engineer determines that no further work is needed, the Commissioner will request that the Board of Acquisition and Contract approve the completion of the project and authorize payment of the Final Estimate. Also required prior to the Board of Acquisition and Contract approval is a Condition Report by the Contractor that any damage of public or privately owned properties resulting from the Contractor's work has been satisfactorily repaired.

2) As a condition precedent to receiving Final Payment therefore the Contractor shall submit a supplementary verified statement similar to that required under, "A. Substantial Completion Payment", hereof. This verified statement must include only those charges for Extra Work, Change Orders, additional time, damages or credits (collectively referred to as "claims") that accrued between substantial completion and final completion. The Contractor's failure to submit the verified statement shall constitute a full and final waiver of all claims against the County from the beginning of the project through the date of substantial completion as established by the County. The presentation of the verified statement to the County shall not constitute an acknowledgement by the County that any such claim is valid. The County expressly reserves its right to assert that any such claim is waived or precluded by reason of other provisions of the contract documents. Only claims particularly identified on the Contractor's supplementary verified statement shall be preserved; all other claims of whatever nature shall be deemed waived and released.

3) The Contractor shall also, prior to the issuance of Final Payment, supply to the County affidavits and certificates for labor, material and equipment (where applicable).

4) The County will, not less than thirty (30) days after the Final Acceptance of the work under this contract, by the Board of Acquisition and Contract, pay the Contractor upon the receipt of all required documentation the balance of funds due thereunder after deduction of all previous payments, liens and all percentages and amounts to be kept and retained under provision of this contract.

   All prior Partial Payments, being merely estimates made to enable the Contractor to prosecute the work more advantageously, shall be subject to correction in the Final Estimate and Payment

5) The acceptance by the Contractor or by anyone claiming by or through him of the Final Payment shall operate as and shall be a release to the County and every officer and agent thereof, from any and all claims of the Contractor for anything done or furnished in connection with this work or project and for any act or omission of the County or of any others relating to or affecting the work. No payment, however, final or otherwise, shall operate to release the Contractor or its Sureties from any obligation under this contract or the Performance and Payment Bond. Should the Contractor refuse to accept the final payment as tendered by the County, it shall constitute a waiver of any rights to interest thereon. Nor shall refusal to accept final payment extend any applicable statute of limitation.

23. PAYMENTS TO SUBCONTRACTORS AND MATERIALMEN BY CONTRACTOR

Within fifteen calendar days of the receipt of any payment from the County, the contractor shall pay each of its sub-contractors and materialmen the proceeds from the payment representing the value of the work performed and/or materials furnished by the subcontractor and/or materialmen as reflected in the payment from the owner less an amount necessary to satisfy any claims, liens or judgment against the subcontractor or materialman which have not been suitably discharged and less any retained amount as hereafter described. The contractor shall retain not more than five per centum of each payment to the subcontractor and/or materialman except that the contractor may retain in excess of five per centum but not more than ten per centum of each payment to the subcontractor provided that prior to entering into a subcontract with the contractor, the sub-contractor is unable or unwilling to provide a performance bond and a labor and material bond both in the full amount of the sub-contract at the request of the contractor. However, the contractor shall retain nothing from those payments representing proceeds owed the subcontractor and/or materialman from the County's payments to the contractor for the remaining amounts of the contract balance as provided in Article “Estimates and Payments” of the Information For Bidders. Within fifteen calendar days of the receipts of payment from the contractor, the subcontractor and/or materialman shall pay each of its subcontractors and materialmen in the same manner as the contractor has paid the subcontractor.

Nothing provided herein shall create any obligation on the part of the County to pay or to see the payment of any moneys to any subcontractor or materialman from any contractor nor shall anything provided herein serve to create any relationship in contract or otherwise, implied or expressed between the subcontractor or materialman and the County. Notwithstanding anything to the foregoing, the County may tender payments to the Contractor in the form of joint or dual payee checks.

NOTICE: No direct payment will be made for work done or materials furnished under the General Clauses, Information for Bidders, General Clauses and Special Clauses, except where expressly stated elsewhere, but compensation shall be deemed to be included in the contract lump sum price for the total work and/or the contract unit prices for the various items of the work.

24. TIME OF STARTING

Time being of the essence, all bidders shall take notice that the timely completion of the work called for under this contract is of the greatest importance. The contractor shall commence its work within ten (10) days after "notice to proceed" has been given it by the Commissioner (unless a definite starting date is stated). Prior to commencing its work, the Contractor shall notify the Director of Project Management, Division of Engineering and Department of Public Works, at least forty-eight (48) hours prior to the planned date of its "start", so that a Construction Administrator can be assigned to the work.

25. SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION AND DEMOLITION WORK

At all times the Contractor shall use all required and necessary precautions for the safety and protection of the public, County personnel, construction employees, and private and public property on or adjacent to the work.

The Contractor shall comply fully with all the applicable provisions of the following listed governmental regulations and standards, noting that in case of conflict, the Contractor shall comply with the most stringent rule or regulation:

1) State of New York, Department of Labor, Bureau of Standards and Appeals, Industrial Code Rule 23 "Protection of Persons Employed in Construction and Demolition Work."

2) United States Department of Labor, Bureau of Labor Standards, "Safety and Health Regulations for Construction," as promulgated in accordance with the Occupational Safety and Health Act of 1970, Public Law 91-596; 84 Stat. 1590, Laws of 91st Congress - 2nd Session.

It shall be the sole responsibility of the Contractor to ascertain which of the regulations and standards contained in the foregoing listed publications effect its construction activities, and it shall be solely responsible for the penalties resulting from its failure to comply with such applicable rules and regulations. Copies of the listed publications are available for reference purposes only, in the Westchester County Department of Public Works, Division of Engineering, Design Section, Room 500, Michaelian Office Building, White Plains, New York.

The West Nile Mosquito control program:

1) Routinely, the work site should be inspected for potential habitats (i.e. stagnant/standing water) for mosquitoes.

2) Conditions that would require remediation include: improper site grading, ruts/other depressions, water in debris (i.e. containers, tires, etc.), stored or

discarded materials, and excavations, and those cited by the Construction Administrator.

3) Under the direction of the Construction Administrator, the Contractor shall take all necessary preventive and/or corrective action to eliminate the potential breeding grounds.

26. ACCIDENT PREVENTION AND FIRST AID FACILITIES

In addition to conforming to the applicable governmental regulations and standards referred to in Article “Fire Prevention And Control” of the Information For Bidders, the Contractor shall conduct its work in accordance with the recommendations contained in the latest edition of the "Manual of Accident Prevention in Construction," as published by the Associated General Contractors of America, Inc. and the most recent safety codes approved by the American Standards Association. In case of the conflict with the referenced governmental regulations and standards, the most stringent regulation, standard or recommendation shall govern.

Further, and without in any way limiting the Contractor’s obligations hereunder, and in accordance with the instructions of the Construction Administrator, the Contractor shall provide barricades, warning lights, danger and caution signs and other safeguards at all places where the work in any way is a hazard to the public.

The Contractor shall also provide and maintain upon the site at each location where major work is in progress, a completely equipped first aid kit that shall be readily accessible when construction activities are in progress. Posted on each first aid kit shall be the name, location and telephone number of the nearest hospital or doctor with whom the Contractor has previously made arrangements for emergency treatment in case of accident.

27. FIRE PREVENTION AND CONTROL

The Contractor shall abide by such rules and instructions as to fire prevention and control as the municipality having jurisdiction may prescribe. It shall take all necessary steps to prevent its employees from setting fires not required in the construction of the facility and shall be responsible for preventing the escape of fires set in connection with the construction.

It shall at all times provide the proper housekeeping to minimize potential fire hazards, and shall provide approved spark arresters on all steam engines, internal combustion engines and fuels.

Free access to fire hydrants and standpipe connections shall be maintained at all times during construction operations, and portable fire extinguishers shall be provided by the Contractor and made conveniently available throughout the construction site. The Contractor shall also notify its employees of the location of the nearest fire alarm box at all locations where work is in progress.

28. STATE AND LOCAL SALES TAX EXEMPTION

The Contractor's attention is directed to Section 1115 of the Tax Law of New York State, Chapters 513 and 514 of the Laws of 1974. In connection with capital improvement contracts entered into on or after September 1, 1974, all tangible personal property which will become an integral component of a structure, building or real property of New York State, or any of its political sub-divisions, including the County of Westchester, is exempt from State and local retail sales tax and compensating use tax.

Bidders' proposals shall exclude dollar amounts for the payment of State and Local retail sales tax and compensating use tax, for tangible personal property defined above.

The successful bidder shall be obliged to file the required Contractor Exempt Purchase Certificates, which may be obtained from the New York State Department of Taxation and Finance (1-800-462-8100), in order to utilize such exemption.

29. APPRENTICES

The attention of all bidders is directed to Section 220(3-e) of the New York State Labor Law, which is hereby incorporated herein by reference, which requires, among other things, that "Apprentices who are registered under a Bona Fide New York State Registered Apprentice Training Program shall be permitted to work."

30. AFFIRMATIVE ACTION PROVISION

During the performance of this Contract, the Contractor agrees that it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, age or handicap. Contractor shall take affirmative action to ensure that applicants are employed and that employees are treated during employment without regard to their race, color, religion, sex, national origin, age or handicap. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoffs or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Contractor agrees to include, or require the inclusion of the above provision in any subcontract made pursuant to its contract with the County.

31. AFFIRMATIVE ACTION PROGRAM REQUIREMENT

Relative to the award of this Contract, it is required that all bidders completely answer all questions contained in the questionnaire entitled "Affirmative Action Program Requirement" of the Proposal Pages, and properly attest to same.

It is also required that all subcontractors completely answer all questions contained in the questionnaire entitled " Affirmative Action Program Requirement-Subcontractors" of the Sample Forms, and properly attest to same. This form is to be submitted with the request to utilize subcontractor(s).

32. AUTHORITY TO DO BUSINESS IN NEW YORK

Any corporation not incorporated under the Laws of New York State, must furnish a copy of its certificate of authority, from the New York State Secretary of State, to do business in the State of New York, in accordance with Article 13 of the New York State Business Corporation Law.

33. LICENSE REQUIREMENTS (ELECTRICAL)

A. In accordance with the requirements of Local Law No. 20-1997 of Westchester County, no person shall perform work under any contract with the County of Westchester except (i) a licensed Master Electrician; (ii) a licensed "Special Electrician"; or (iii) a Journeyman Electrician working under the direct supervision and control of a Master Electrician.

In no event shall the County incur any liability to pay for any electrical work performed in violation of the licensing requirements of Local Law No. 20-1997 of Westchester County.

B. Contract with separate bids:

If the project is one where separate bid specifications are required pursuant to the provisions of the New York General Municipal Law, then any person, partnership, corporation, business organization or other business entity submitting a bid for the electrical portion of the project must possess, at the time of submission of the Bid, a valid Master/"Special" Electrician's license issued by the Westchester County Electrical Licensing Board in accordance with Chapter 277 Article XVII of the Laws of Westchester County and the Westchester County Electrical Licensing Board Rules & Regulations, in particular No. 11, which states as follows:

> No individual holding a Master Electrician's License shall lend such License to any person or allow any other person to carry on, engage in, or labor at the business as defined herein of installing, removing, altering, testing, replacing, or repairing electrical systems. A violation of this section by any person holding a License shall be sufficient cause for revocation of such License.
>
> However, nothing herein shall be construed to prohibit the use of a License by the holder thereof for or on behalf of a partnership, corporation or other business association, provided that fifty-one (51) percent or more of the control of the voting capital stock of such partnership, corporation, or other business association is owned by one (1) or more holders of a Westchester County Master Electrical License and that all work performed by such partnership, corporation or other business association is performed by or under the direct supervision of such License holder or holders.

C. Contract with single bid:

Where the project does not involve separate bids pursuant to the New York General Municipal Law but where some electrical work is contemplated along with other work, the person, firm, partnership or corporation engaged to perform said electrical work

must possess a valid Master/"Special" Electrician's license issued by the Westchester County Electrical Licensing Board.

D. An electrical bidder must complete the "Certificate of License (Electrical)" of the Proposal Pages and will be required to furnish a copy of such license with the sealed Bid. Other bidders will be required to furnish a copy of such license for the applicable person engaged to perform the electrical work when request by the County, prior to awarding the contract.

E. The license must be maintained at all times during the performance of the work contemplated under the contract. The suspension, revocation or the failure to maintain or renew such license shall, in addition to any other right or remedy available to the County, be grounds for immediate termination of the contract, effective immediately upon notice from the Commissioner.

34. LICENSE REQUIREMENTS (PLUMBING)

A. In accordance with the requirements of Chapter 277, Article XV of the Laws of Westchester County, no person shall perform plumbing work under any contract with the County of Westchester except (i) a licensed Master Plumber; (ii) a certified Journey Level Plumber employed by and under the direction of a licensed Master Plumber; or (iii) an Apprentice Plumber working under the direct supervision and control of a Master Plumber or under the direct supervision and control of a certified Journey Level Plumber in the employ of a licensed Master Plumber.

In no event shall the County incur any liability to pay for any plumbing work performed in violation of the licensing requirements of Chapter 277, Article XV of the Laws of Westchester County.

B. Contract with separate bids:

If the project is one where separate bid specifications are required pursuant to the provisions of the New York General Municipal Law, then any person, partnership, corporation, business organization or other business entity submitting a bid for the plumbing portion of the project must possess, at the time of submission of the Bid, a valid Master Plumber's license issued by the Westchester County Board of Plumbing Examiners in accordance with the Westchester County Board of Plumbing Examiners Rules and Regulations and Chapter 277 Article XV of the Laws of Westchester County, in particular Section 277.509A, which states as follows:

> A. No holder of a license or certification issued under this article shall authorize, consent to or permit the use of his or her license or certification by or on behalf of any other person. No person who has not qualified or obtained a license or certification under this article shall represent himself or herself to the public as holder of a license or certification issued under this article, either directly, by means of signs, sign cards metal plates or stationery, or indirectly in any other manner whatsoever. However, nothing herein shall be construed to prohibit the use of a license by the holder thereof for or on behalf of a partnership, corporation or other business association, provided that 51 percent or more of the control of the voting capital stock of such partnership, corporation or other business

association is owned by one or more holders of a Westchester County master plumbing license and that all work performed by such partnership, corporation or other business association is performed by or under the direct supervision of such license holder or holders.

C. Contract with single bid:

Where the project does not involve separate bids pursuant to the New York General Municipal Law but where some plumbing work is contemplated along with other work, the person, firm, partnership or corporation engaged to perform said plumbing work must possess a valid Master Plumber's license issued by the Westchester County Board of Plumbing Examiners.

D. A plumbing bidder must complete the "Certificate of License (Plumbing)" of the Proposal Pages and will be required to furnish a copy of such license and the County issued identity badge with the sealed Bid. Other bidders will be required to furnish a copy of such license and the County issued identity badge for the applicable person engaged to perform the plumbing work when request by the County, prior to awarding the contract.

E. A restricted Master Plumber's license issued by the Westchester County Board of Plumbing Examiners shall satisfy the requirements of this section provided such restricted license authorizes the Master Plumber to engage in the business of plumbing within the local municipality in which the work under the contract is to be performed.

F. The license must be maintained at all times during the performance of the work contemplated under the contract. The suspension, revocation or the failure to maintain or renew such license shall, in addition to any other right or remedy available to the County, be grounds for immediate termination of the contract, effective immediately upon notice from the Commissioner.

35. LICENSE REQUIREMENTS (HAULERS)

(Haulers Of Solid Waste; Recyclables; Construction And Demolition Debris; Garden And Yard Waste And/Or Scrap Metal)

A. DEFINITIONS:

1) "Class A" refers to all haulers except those whose hauling business is limited solely to Class C, Class D or Class E activities or whose recycling business is limited to Class B activities. Class A Licensees may also conduct Class B, Class C, Class D and Class E activities.

2) "Class B" refers to Recyclable brokers. Class B Licensees may also conduct Class C, Class D and Class E activities.

3) "Class C" refers to haulers who exclusively handle construction and demolition debris. Class C Licensees may also conduct Class D and Class E activities. With respect to Class C haulers, the following shall apply: a. Class "C-1" shall refer to a business or subsidiary which generates construction and demolition debris, as defined herein, and which, incidental to such business, transports, stores, processes, transfers or disposes of the construction and demolition debris generated by the

operations of such business or subsidiary. Class "C-1" Licensees may also conduct Class E activities; b. Class "C-2" shall refer to all other businesses which otherwise transport, collect, store, transfer, process, or dispose of construction and demolition debris. Class "C-2" haulers may also conduct Class "C-1", Class D and Class E activities.

4) "Class D" refers to (i) haulers who collect, store, transport, transfer, process or dispose of garden and yard waste generated, originated or brought within the County where such garden and yard waste was previously generated by a person or entity other than the Licensees and/or (ii) haulers who collect, store, transport, transfer, process or dispose of garden and yard waste and which own, lease, or control one or more vehicles having three (3) or more axles which vehicles will be used in the collection, storage, transfer, transportation, processing or disposal of garden and yard waste generated, originated or brought within the County.

5) "Class E" refers to haulers who exclusively conduct a scrap peddler business.

6) "Construction and Demolition Debris" means uncontaminated Solid Waste resulting from the construction, remodeling, repair and demolition of structures and roads, and uncontaminated Solid Waste consisting of vegetation resulting from land clearing and grubbing, utility line maintenance and seasonal and storm-related cleanup. Such waste includes, but is not limited to, bricks, concrete and other masonry materials, soil, rock, wood, wall coverings, plaster, drywall, plumbing fixtures, non-asbestos insulation, roofing shingles, asphaltic pavement, glass, plastics that are not sealed in a manner that conceals other waste, electrical wiring and components containing no hazardous liquids, metals, and trees or tree limbs that are incidental to any of the above.

7) "Hauler" means any person excluding municipalities, the County and any County district including, but not limited to, Refuse Disposal District No. 1 and all County sewer and water districts, who, for a fee or other consideration, collects, stores, processes, transfers, transports or disposes of Solid Waste, Recyclables or construction and demolition debris that is generated or originated within the County or brought within the boundaries of the County for disposal, storage, transfer or processing.

8) "Recyclables" means those materials defined as "Recyclables" under Section 825.30 (8) of the Westchester County Source Separation Law.

9) "Scrap Peddler" shall mean any person who collects scrap materials for sale to a Recyclable broker using no more than one vehicle for collection and transportation of such materials.

10) "Solid Waste" means all putrescible and non-putrescible materials or substances, except as described in Paragraph 4 of 6 NYCRR Part 360-1.2(a), and/or regulated under 6 NYCRR Part 364, that are discarded or rejected as being spent, useless, worthless or in excess to the owners at the time of such discard or rejection including, but not limited to, garbage, refuse, commercial waste, rubbish, ashes, incinerator residue and construction and demolition debris. "Solid Waste" shall not be understood to include Recyclables as defined above.

B. **PLEASE TAKE NOTICE -** In accordance with the requirements of Chapter 826-a, Article III of the Laws of Westchester County, it is unlawful for any person to collect, store, transfer, transport or dispose of solid waste; recyclables; construction and demolition debris; garden and yard waste and/or scrap metal, as defined herein, that is generated or originated within the County or brought within the boundaries of the County for disposal, storage, transfer or processing, or to conduct any activities defined as Class A, Class B, Class C, Class D or Class E activities under Chapter 826-a of the Laws of Westchester County, in Westchester County (hereinafter collectively referred to as "hauling") without having first obtained a license therefore from the Westchester County Solid Waste Commission.

In no event shall the County incur any liability with respect to any hauling activities conducted by the bidder or any subcontractor of the bidder in violation of Chapter 826-a of the Laws of Westchester County.

C. Where the project necessitates that hauling be performed, either the bidder or the person, partnership, corporation, business organization or other business entity engaged to perform such hauling work on behalf of the bidder (hereinafter the "subcontractor") must possess a valid license issued by the Westchester County Solid Waste Commission at the time of submission of the bid and throughout the duration of any contract issued pursuant thereto.

D. A hauler bidder must complete the “Certificate of License (Hauler)” of the Proposal Pages and will be required to furnish a copy of such license with the sealed bid. Other bidders will be required to furnish a copy of such license for the applicable person engaged to perform the hauling work when requested by the County, prior to awarding the contract.

E. The suspension, revocation, or the failure to maintain or renew such license may, in addition to any other right or remedy available to the County, be grounds for termination of the contract, effective immediately upon notice from the Commissioner. The bidder which is awarded the contract hereunder shall have a continuing obligation to notify the Commissioner, within (2) business days, of any suspension, revocation or other action taken with respect to any license issued by the Westchester County Solid Waste Commission which may limit or impair the bidder's ability, or the ability of any authorized subcontractor, to perform such hauling work in the County of Westchester.

It shall be the bidder's responsibility to ensure that any subcontractor who will perform the hauling services required under any contract issued pursuant to this bid specification has a valid license for the duration of the term of any contract awarded hereunder.

F. In the event that a license held by the bidder or its subcontractor is revoked, suspended or otherwise discontinued by the Westchester County Solid Waste Commission, or in the event that the bidder is otherwise required to obtain the services of a new or alternate subcontractor for the hauling work, the bidder shall immediately notify the Commissioner and seek the Commissioner's approval for the use of such subcontractor to provide the hauling services which are required under the contract, and shall provide the Commissioner with a copy of the license issued by the Westchester County Solid Waste Commission to such subcontractor. No bidder or subcontractor shall provide

hauling services under the contract until a copy of its license has been provided to the Commissioner and the Commissioner has approved of such bidder or subcontractor.

36. MINORITY PARTICIPATION POLICY

A. Pursuant to Chapter 308 of the Laws of the County of Westchester, the County encourages the meaningful and significant participation of business enterprises owned by persons of color and women - Minority Business Enterprise (MBE) and Women Business Enterprise(WBE); on County of Westchester contracts.

B. It is the goal of the County of Westchester to use its best efforts to encourage, promote and increase participation of business enterprises owned and controlled by persons of color or women (MBE/WBE) in contracts and projects funded by all departments of the County and to develop a policy to efficiently and effectively monitor such participation.

C. In recognition of the need to promote the development of business enterprises owned and controlled by persons of color and women to achieve a goal of equal opportunity, and overcome the existing under representation of these groups in the business community, the County of Westchester acting through its Office of Economic Development shall as a lawful public and County purpose provide technical and informational assistance to such business enterprises with a particular emphasis on education programs to encourage participation in the contract procurement process.

D. For the purposes of this Local Law, a business enterprise owned and controlled by women or persons of color shall be construed to mean a business enterprise including a sole proprietorship, partnership or corporation that is: (a) at least 51% owned by one or more persons of color or women; (b) an enterprise in which such ownership by persons of color or women is real, substantial and continuing; (c) an enterprise in which such ownership interest by persons of color or women has and exercises the authority to control and operate, independently, the day-to-day business decisions of the enterprise; and (d) an enterprise authorized to do business in this state which is independently owned and operated. In addition, a business enterprise owned and controlled by persons of color or women shall be deemed to include any business enterprise certified as an MBE or WBE pursuant to Article 15-a of the New York State Executive Law and implementing regulations, 9 NYCRR Subtitle N Part 540 et seq., or as a small disadvantaged business concern pursuant to the Small Business Act, 15 U.S.C. 631 et seq., and the relevant provisions of the Code of Federal Regulations as amended.

E. The Contractor hereby acknowledges and agrees:

1) That in the hiring of employees for the performance of work under this contract or any subcontract hereunder, no contractor, subcontractor, nor any person acting on behalf of such contractor or subcontractor, shall be reason of race, creed, color, religion, gender, age, ethnicity, disability, sex, alienage or citizenship status, national origin, marital status, sexual orientation, familial status, genetic predisposition or carrier status discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates;

2) That no contractor, subcontractor, nor any person on its behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, creed, color, religion, gender, age, ethnicity, disability, sex, alienage or citizenship status, national origin, marital status, sexual orientation, familial status, genetic predisposition or carrier status;

3) That there may be deducted from the amount payable to the contractor by the County under this contract a penalty of fifty (50) dollars for each person for each calendar day during which such person was discriminated against or intimidated in violation of the provisions of the contract;

4) That this contract may be canceled or terminated by the County, and all moneys due or to become due hereunder may be forfeited, for a second or any subsequent violation of the terms or conditions of this section of the contract; and

5) The aforesaid provisions of this section covering every contract for or on behalf of the County for the manufacture, sale or distribution of materials, equipment or supplies shall be limited to operations performed within the territorial limits of the State of New York.

6) Contractor agrees to include, or require the inclusion of the above provision in any subcontract made pursuant to its contract with the County.

F. In furtherance of the Contractor's obligation to make documented good faith efforts to utilize Minority Business Enterprises (MBE) and Women's Business Enterprises (WBE) for the Work required by this Contract, the Contractor shall provide the Minority/Women Business Enterprise Questionnaire signed by an officer of the Contractor, and any additional information requested by the County, including but not limited to the following, which shall be delivered to the Construction Administrator and , Program Manager of Minority- and Women-Owned Business Program, County of Westchester, Room 911, 148 Martine Avenue, White Plains, New York 10601 coincident with the Contractor's delivery to the County of its bid and shall be provided by the Contractor with any request for approval of subcontractors:

1 (a) The name, address, telephone number and contact person of each MBE and WBE solicited verbally by Contractor during the applicable period for the performance of any portion of the Contractor's Work and the date(s) that each such solicitation was made;

1 (b) A description of the portion of the Contractor's Work for which each such solicitation is made.

1 (c) A listing of the project documents, if any, furnished to each such MBE and WBE.

2. A copy of each written solicitation sent by the Contractor to each MBE and WBE and the name and address of each MBE and WBE to whom the solicitation was made.

3) The name and address of each MBE and WBE that performs any portion of the Contractor's Work, a description of such portion of the Work and the dollar

amount therefore.

4) A statement that the Contractor reviewed a list of MBE and WBE contractors in their outreach efforts. A list can be found at www.westchestergov.com/mwob.

5) Indicate those MBE and WBE contractors found on the list that provided the type of subcontractor services required for this project. If none were found, please indicate.

6) Describe other outreach efforts, including other MBE and/or WBE lists, organizations or individuals that were contacted.

The failure of the low bidder to comply with the provisions of this subparagraph F may result in the County NOT awarding this contract to your firm. Failure of the Contractor to comply with the provisions of this subparagraph F may constitute a material breach of this Contract. Failure to comply with the Minority Participation Policy may be considered by the County when awarding contracts.

37. SEXUAL HARASSMENT POLICY

A. As with discrimination involving race, color, religion, age, sexual orientation, disability, and national origin, Westchester County also prohibits sex discrimination, including sexual harassment of its employees in any form. The County will take all steps necessary to prevent and stop the occurrence of sexual harassment in the workplace.

1) **This policy applies to all County employees and all personnel in a contractual relationship with the County**. Depending on the extent of the County's exercise of control, this policy may be applied to the conduct of non-County employees with respect to sexual harassment of County employees in the workplace.

2) This sexual harassment policy includes, but is not limited to, inappropriate forms of behavior described by the Equal Employment Opportunity Commission.

B. Sexual advances that are not welcome, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitutes sexual harassment when:

1) Submission to such conduct is made either explicitly or implicitly a term or condition of an individual's employment; -OR-

2) Submission to or rejection of such conduct by an individual is used as the basis for employment decisions, such as promotion, transfer, or termination, affecting such individuals; -OR-

3) Such conduct has the purpose or effect of unreasonably interfering with an individual's work performance or creating an intimidating, hostile or offensive working environment.

C. Sexual harassment refers to behavior that is not welcome, that is personally offensive, that fails to respect the rights of others, that lowers morale and that, therefore, interferes

with an employee's work performance and effectiveness or creates an intimidating, hostile or offensive working environment.

38. SMOKE-FREE WORKPLACE POLICY

A. By way of Executive Order No. 5 of 1998 and Local Law 3 of 2003, it is now the policy of the County of Westchester to institute a smoke-free "workplace".

B. Every indoor County "workplace", shall become a smoke-free area. The smoking or carrying of lighted cigarettes, cigars, pipes, or any other tobacco-based products, or products that result in smoke, is hereby banned.

C. Every indoor County "workplace" shall be covered under this Executive Order, including the County Jail in Valhalla and the Westchester County Center in White Plains. This Executive Order shall not, however, apply to County-owned facilities that are not County "workplaces", such as employees housing or privately run restaurants on County property (e.g. at the County golf courses).

D. The Richard J. Daronco County Courthouse shall not, for purposes of this Executive Order, be considered a County "workplace", and therefore shall not be required to be smoke-free.

E. This Executive Order is intended to be consistent with, and not modify, any provisions of the New York State Public Health Law.

F. This Executive Order shall take effect immediately and remain in full force and effect until otherwise superseded or revoked.

39. COUNTY ENERGY EFFICIENT PURCHASING POLICY

A. By way of Executive Order No. 9 of 2002, it is now the policy of the County of Westchester to institute an Energy Efficient Purchasing Policy.

B. This policy shall apply to all purchases made by and for the County in accordance with applicable laws, rules and regulations.

C. Wherever the price is reasonably competitive and the quality adequate for the purpose intended, purchase and utilization of products that meet Energy Star requirements for energy efficiency as determined by the United States Environmental Protection Agency and the United States Department of Energy is hereby recommended.

D. If the Energy Star label is not available with respect to a particular product, than it is recommended that products in the upper twenty-five percent of energy efficiency as designated by the United States Federal Energy Management Program shall be purchased and utilized if the prices of those products are reasonably competitive and the quality adequate for the purpose intended.

40. RESTRICTION ON USE OF TROPICAL HARDWOODS

A. The bidder/proposer shall not use or propose to use any tropical hardwoods or tropical hardwood products in any form, except in accordance with State Finance Law § 165 (Use of Tropical Hardwoods), as may be amended from time to time. Pursuant to the

State Finance Law § 165, any bid/proposal which proposes or calls for the use of any tropical hardwood or wood product in the performance of the contract shall be deemed non-responsive.

41. DISCLOSURE OF RELATIONSHIPS TO COUNTY

A. The successful bidder is required to complete the form entitled "Required Disclosure of Relationships to County" on Proposal Pages 32-33 before award of the contract.

B. In the event that any information provided on the completed Proposal Pages entitled "Required Disclosure of Relationships to County" changes during the term of this agreement, the Contractor shall notify the Commissioner in writing within ten (10) days of such event by submitting a revised "Required Disclosure of Relationships to County" form.

42. CONTRACTOR DISCLOSURE STATEMENT

The Contractor and each Major Subcontractor represents that all information provided by the Contractor and Major Subcontractor in the form entitled "Contractor Disclosure Statement" on Proposal Pages 23-31 is in all respects true and correct. In the event the information provided on that document changes during the term of this agreement or for a period of three (3) years after the date that the Contractor and/or the Major Subcontractor receives final payment under this agreement, the Contractor and/or Major Subcontractor shall notify the Commissioner in writing within ten (10) days of such event by submitting a revised "Contractor/Major Subcontractor Disclosure Statement". Bidders must complete the Required Disclosure of Relationships to County form. The Required Disclosure of Relationships to County form is located on Proposal Pages 32-33.

43. CRIMINAL BACKGROUND INFORMATION

Pursuant to Executive Order 1-2008 and subject to the applicable provisions of New York Correction Law §§ 752 and 753, the County shall have the right to bar the following "Persons Subject to Disclosure" (Persons shall mean individuals or legal entities) from providing work or services to the County or from being on County property:

(a) Consultants, Contractors, Licensees, Lessees of County owned real property, their principals, agents, employees, volunteers or any other person acting on behalf of said Contractor, Consultant, Licensee, or Lessee who is at least sixteen (16) years old, including but not limited to Subconsultants, Subcontractors, Sublessees or Sublicensees who are providing services to the County; and

(b) Any family member or other person, who is at least sixteen (16) years old, residing in the household of a County employee who lives in housing provided by the County located on County property.

If any of the above mentioned Persons Subject to Disclosure has either one of the following:

(a) A conviction of a crime (all felonies and misdemeanors as defined under the New York State Penal Law or the equivalent under Federal law or the laws of any other State);

(b) A pending criminal proceeding for a crime(s) as defined above; or

(c) A refusal to answer such questions.

Where the following criteria apply:

(a) If any of the Persons Subject to Disclosure providing work or services to the County in relation to a County Contract are not subject to constant monitoring by County staff while performing tasks and/or while such persons are present on County property pursuant to the County Contract; and

(b) If any of the Persons Subject to Disclosure providing work or services to the County, in relation to a County Contract may, in the course of providing those services, have access to sensitive data (for example, Social Security Numbers and other personal/secure data); facilities (secure facilities and/or communication equipment); and/or vulnerable populations (for example, children, seniors and the infirm).

Accordingly, the Contractor is required to review the Instructions found in the instructions and complete "Contractor and all persons subject to Disclosure Certification Forms" located at Forms Pages 11-13 as well as any other applicable criminal disclosure forms (i.e., Forms Pages 14 through 19," together with Forms Pages 11-13 collectively referred to as "Disclosure Forms").

However, the following Persons Subject to Disclosure are **exempt** from Executive Order 1-2008: (i) those persons for whom the County has already conducted a background check and issued a security clearance that is in full force and effect; or (ii) those persons for whom another state or federal agency having appropriate jurisdiction has conducted a security and/or background clearance or has implemented other protocols or criteria for this purpose that apply to the subject matter of this Contract that is in full force and effect.

If a Person Subject to Disclosure is exempt from the disclosure described in Executive Order 1-2008 because of either "i" or "ii" above, then the Contractor shall notify the Procuring Officer[1] in the respective Department of its claim of exemption and it shall be the responsibility of the Procuring Officer to verify each exemption. If the Procuring Officer determines that the Contractor is exempt under sections "i" or "ii" above, the Procuring Officer shall confirm same with the Contractor and maintain a written record including all supporting details of the verification of and acknowledgement of said exemption.

If the Procuring Officer determines that the Contractor is not exempt under sections "i" or "ii" above, the Procuring Officer shall notify the Contractor in writing, and the appropriate Disclosure Forms shall be required.

It shall be the Contractor's duty to disclose and to inquire of each and every Person Subject to Disclosure, whether they have been convicted of a crime or whether they are currently subject to pending criminal charges. It shall be the duty of the Contractor to submit a completed Certification Form "Forms Pages 11-13"annexed hereto as ," which certifies that the Contractor and every Person Subject to Disclosure has been asked whether they have been convicted of a crime or are currently subject to pending criminal charges.

Should the Contractor or any Person Subject to Disclosure (also referred to as "Person")

[1] "Procuring Officer" shall mean the head of the department or the individual(s) authorized by the head(s) of the department(s) undertaking the procurement and with respect to those matters delegated to the Bureau of Purchase and Supply pursuant to Section 161.11(a) of the Laws of Westchester County, the Purchasing Agent.

affirmatively advise that they have been convicted of a crime said Person shall be identified in Forms Page 14 entitled "Names And Titles Of Persons Subject To Disclosure That Answered Yes" to any questions on Forms Pages11-13 and shall complete Forms Pages 15-16 entitled, "Criminal Background Disclosure Form For Persons Who Have Been Convicted of A Crime."

Should the Contractor or any Person Subject to Disclosure advise that they are subject to pending criminal charges, said Person shall be identified in Forms Page 14 and shall complete the form annexed hereto as Forms Pages 17-18 entitled, "Criminal Background Disclosure Form For Persons Who Are Subject to Pending Criminal Charges."

Should the Contractor or any Person Subject to Disclosure refuse to answer whether they have been convicted of a crime or are currently subject to pending criminal charges, the name and title of said Person(s) shall be listed on Forms Page 19 entitled "Persons That refused To Answer".

It shall be the duty of the Contractor to submit to the Procuring Officer all of the attached applicable Disclosure Forms prior to the commencement of this Contract. It is the responsibility of each Contractor to assure that all of their proposed Subcontractors complete the criminal background and disclosure certification forms and submit the forms to the Procuring Officer before they will be approved to perform work on the contract.

Under no circumstances shall the existence of a language barrier serve as a basis for the waiver of or an exception to this obligation. If the Contractor needs to obtain translation services to fulfill this obligation, it shall be at the sole cost and expense of the Contractor.

The Contractor shall be required to make the same inquiry and forward updated Disclosure Forms to the Procuring Officer regarding additional Persons Subject to Disclosure in connection with this Contract during the term of this Contract. **NO NEW PERSON SUBJECT TO DISCLOSURE SHALL PERFORM WORK OR SERVICES OR ENTER ONTO COUNTY PREMISES UNTIL THE UPDATED DISCLOSURE FORMS ARE FILED WITH THE PROCURING OFFICER.**

THE CONTRACTOR HAS A CONTINUING OBLIGATION TO MAINTAIN THE ACCURACY OF THE DISCLOSURE FORMS FOR THE DURATION OF THIS CONTRACT, INCLUDING ANY AMENDMENTS OR EXTENSIONS THERETO AND SHALL PROVIDE ANY UPDATES TO THE PROCURING OFFICER AS NECESSARY TO COMPLY WITH THE DISCLOSURE REQUIREMENTS BY EXECUTIVE ORDER 1-2008.

Any failure by the Contractor to comply with the disclosure requirements of Executive Order 1–2008, absent proof of exemption deemed satisfactory by the County Procuring Officer, may be considered by the County, a material breach by the Contractor and may be grounds for immediate termination of this Agreement by the County.

44. MANDATORY OSHA CONSTRUCTION SAFETY AND HEALTH TRAINING

Pursuant to NYS Labor Law §220-h – On all public work projects of at least $250,000 all laborers, workers and mechanics employed, in the performance of the contract on the public work site, either by the contractor, sub-contractor or other person doing or contracting to do the

whole or a part of the work contemplated by the contract, are required to be certified as having successfully completed an OSHA construction safety and health course of at least 10 hours prior to performing any work on the project.

3. GENERAL CLAUSES

DEPARTMENT OF PUBLIC WORKS

Division of Engineering

1. MATERIAL AND WORKMANSHIP

It is the intent of these specifications to require first-class work and new and best quality materials. For any unexpected features arising during the progress of the work and not fully covered herein the specifications shall be interpreted to require first-class work and materials, and such interpretations shall be binding upon the Contractor.

1) Upon award of the Contract, the Contractor shall furnish in writing to the Construction Administrator the sources of supply for concrete, and other materials that it proposes to use in the work, and material shall not be furnished from other sources of supply except after written approval by the Construction Administrator. The Contractor shall, before ordering equipment verify that Suppliers of equipment will provide the required warranties, guarantees, and maintenance services.

2. DEFINITIONS

COMMISSIONER - The head of the Department of Public Works of the County of Westchester.

CONSTRUCTION ADMINISTRATOR- The representative of the Commissioner of Public Works at the project site who, unless specifically designated otherwise in the Contract, shall in the first instance, make such determinations as are necessary for the expeditious completion of the Work, except for those determinations that are reserved to the Commissioner.

CONTRACT - Shall mean each of the various parts of these documents both as a whole or severally and except for titles, subtitles, headings and table of contents, shall include the Notice to Bidders, Information for Bidders, the Proposal, the Specifications, the Performance Bond, the Plans, the Contract Form, and all addenda and provisions required by law.

CONTRACTOR - Party of the second part to the Contract acting directly or through its agents, subcontractors, or employees, and who is responsible for all debts pertaining to and for the acceptable performance of the work for which it had contracted.

COUNTY - Party of the first part to the Contract as represented by the Board of Acquisition and Contract and the Commissioner of Public Works for the County of Westchester.

ENGINEER - An Engineer or Architect that designed the project and is serving as the duly authorized representative of the Commissioner of Public Works who, in addition to the duties set forth in the Contract, shall, in the first instance, make such determinations as are necessary to ensure the Contractor's compliance with its obligations for the preparation and submission of shop drawings and all other submittals required for the Work. If there is no Engineer the duties of the Engineer shall be performed by the Construction Administrator and all references in this

Agreement to the Engineer shall be deemed to mean the Construction Administrator.

MAJOR SUBCONTRACTOR- Subcontractors performing all or a portion of the work for Electrical; Heating, Ventilating and Air Conditioning; Fire Prevention; General Construction; and/or any Subcontractor whose subcontract price is equal to or greater than ten percent (10%) of the Contract Price.

OWNER - The County of Westchester.

PLANS - All official drawings or reproductions of drawings pertaining to the work or to any structure connected therewith.

SPECIFICATIONS - The body of directions, requirements, etc. contained in this present volume, together with all documents of any descriptions and agreements made (or to be made), pertaining to the methods(or manner) of performing the work or to the quantities and quality. Specifications shall also include the Notice to Contractors, Instructions to Bidders, Bond, Proposal and Contract Agreement.

SURETY - The corporate body, which is bound with and for the Contractor and which engages to be responsible for the faithful performance of the contract, and to indemnify the County against all claims for damages.

A.A.S.H.O. - American Association of State Highway Officials

A.R.E.A. - American Railway Engineering Association

A.S.T.M. - American Society for Testing Materials

A.W.W.A. - American Water Works Association

N.E.C. - National Electrical Code

N.E.M.A. - National Electric Manufacturers Association

3. BOUNDARIES OF WORK

The County will provide land or rights-of-way for the work specified in this Contract. Other contractors, employees or concessionaires of the county, may for all necessary purposes enter upon the work and premises used by the Contractor, and the Contractor shall give to other contractors and employees of the County all reasonable facilities and assistance for the completion of adjoining work.

4. OVERLAPPING WORK

The Contractor shall take notice that because of work on other contracts within and adjacent to the contract limits it may not have exclusive occupancy of the territory within or adjacent

to the contract limits, and that during the life of this contract the owners and operators of Public Utilities may make changes in their facilities.

The said changes may be made by utility employees or by contract within or adjacent to the contract limits and may be both temporary and permanent.

The Contractor shall cooperate with other Contractors and owners of various utilities and shall coordinate and arrange the sequence of its work to conform with the progressive operations of work already or to be put under contract. Cooperation with Contractors already or to be engaged upon the site is essential to properly coordinate the construction efforts of all Contractors, Utility Owners and Subcontractors engaged in work within and adjacent to the contract limits.

The Contractor shall coordinate the work of its various Subcontractors. Their respective operations shall be arranged and conducted so that delays are avoided. Where the work of the Contractor or Subcontractor overlaps or dovetails with that of other Contractors, materials shall be delivered and operations conducted so as to carry on the work continuously in an efficient and workmanlike manner. The Contractor shall coordinate its work to be done hereunder with the work of the other Contractor(s) and the Contractor shall fully cooperate with such other Contractor(s) and carefully fit its own work to that provided under other contracts as may be directed by the Construction Administrator. If the Construction Administrator shall determine that the Contractor is failing to coordinate its work with the work of the other Contractor(s) as the Construction Administrator has directed, then the Commissioner shall have the right, at its sole option, to withhold any payments otherwise due hereunder until the Construction Administrator's directions are complied with by the Contractor and/or deduct the costs incurred by the County due to the Contractor's failure or refusal to so cooperate. Delays or oversights on the part of the Contractor or Subcontractors or Utility Owners in performing their work in the proper manner thereby causing cutting, removing and replacing work already in place, shall not be the basis for a claim for extra compensation.

In the event of interference between operations of Utility Owners and other Contractors, or among the Contractors themselves, the Construction Administrator shall be the sole judge of the rights of each Contractor insofar as the sequence of work necessary to expedite the completion of the entire project, and in all cases its decision shall be final. The Contractor agrees that it has included in its unit prices bid for the various items of the contract the possible additional cost of performing the work under this contract because it may not have a clear site for its work and because of possible interference of roadway use, other Contractors and necessary utility work, and the necessity or desirability of opening certain sections of pavement to traffic before the entire work is completed. The County shall not be liable for any damages suffered by any Contractor by reason of another Contractor's failure to comply with the directions of the Construction Administrator, or by reason of another Contractor's default in performance or by any act or failure to act of any Utility Owner or anyone working on its behalf, it being understood that the County does not guarantee the responsibility or continued efficiency of any Contractor or Utility Owner and under no circumstances shall the County be liable to any Contractor or Utility Owner for any delays, interferences or any other impediment or hindrance to the Contractor's or Utility Owner's work .

Should the Contractor sustain any damage through any act or omission of any other contractor having a Contract with the County for the performance of work upon the site or of work which may be necessary to be performed for the proper prosecution of the work to be performed hereunder, or through any act or omission of a supplier or subcontractor of whatever tier of such contractor, the Contractor shall have no claim against the County for such damage, but shall have a right to recover such damage from the other contractor under the provision similar to the following provision that has been or will be inserted in the Contracts with such other contractors.

Should any other Contractor having or who shall hereafter have a Contract with the County for the performance of work upon the site sustain any damage through any act or omission of the Contractor hereunder or through the act or omission of any subcontractor of whatever tier of the Contractor, the Contractor agrees to reimburse such other Contractor for all such damages and to defend at his own expense any suit based upon such claim and if any judgment or claims against the County shall be allowed the Contractor shall pay or satisfy such judgment or claim and pay all costs and expenses, including attorney's fees, incurred by the County in connection therewith and to indemnify and hold the County harmless from all such claims.

The County's right to indemnification hereunder shall not be diminished or waived by its assessment against the Contractor of liquidated damages as may be provided elsewhere herein.

Delays in availability of any part of the site or any delays due to interference between the several Contractors and the Utility Owners shall be compensated for by the Construction Administrator solely through granting an extension of time in which to complete the work of the contract without assessment of Engineering charges. The Contractor in submitting its bid hereby agrees that it shall make no other claim against the County for any damages due to such delays or interference.

5. PROPER METHOD OF WORK AND PROPER MATERIALS

The Construction Administrator shall have the power in general to direct the order and sequence of the work, which will be such as to permit the entire work under this contract to be begun and to proceed as rapidly as possible, and such as to bring the several parts of the work to a successful completion at about the same time.

If at any time before the commencement or during the progress of the work the materials and appliances used or to be used appear to the Construction Administrator as insufficient or improper for securing the quality of work required, or the required rate of progress, he may order the Contractor to increase their efficiency or to improve their character, and the Contractor shall promptly conform to such order; but the failure of the Construction Administrator to demand any increase of such efficiency or improvement shall not release the Contractor from its obligation to secure the quality of work or the rate of progress specified.

6. CONTROL OF AREA

Unloading of materials and parking of equipment shall be subject to the orders of the Construction Administrator so far as he may find necessary for the protection and safety of the traveling public and the preservation of property.

7. PERMITS, FEES, ETC.

The County will obtain at its sole cost the necessary New York State Pollutant Discharge Elimination System ("SPDES") Permit and will sign the associated Notice of Intent ("NOI"). The Contractor and its subcontractors will sign the required Certification Statement (a copy of which is contained as Proposal Page) when it signs the contract.

All necessary permits from County, State or other concerned Public Authorities shall be secured at the cost and expense of the Contractor. It shall also give all notices required by law, ordinance, or the rules and regulations of the concerned Public Bureaus or Departments, and also as a part of the Contract, comply without extra charge or compensation with all State Laws and all other Ordinances or Regulations that may be applicable to this work. Contractor, however, shall first notify the Commissioner before proceeding with securing of all necessary permits and the giving of required notices.

8. TRAFFIC

The General Contractor shall be responsible for the Maintenance and Protection of traffic at all times until the date of completion and acceptance of its work.

During the whole course of the work the Contractor shall so conduct its work and operations so as to interfere with traffic passing the work as little as possible and effect by every reasonable means the safety and comfort of pedestrians, vehicles and vehicle passengers passing the work.

9. INSPECTION

The Contractor shall at all times provide convenient access and safe and proper facilities for the inspection of all parts of the work. No work, except such shop work as may be so permitted, shall be done except in the presence of the Construction Administrator or his/her assistants. No material of any kind shall be used upon the work until it has been inspected and accepted by the Construction Administrator. All materials rejected shall be immediately removed from the work and not again offered for inspection. Any materials or workmanship found at any time to be defective shall be remedied at once, regardless of previous inspection. The inspection and supervision of the work by the Construction Administrator is intended to aid the Contractor in supplying labor and materials in accordance with the specifications, but such inspection shall not operate to release the Contractor from any of its contract obligations.

10. STOPPING WORK

The Commissioner, Construction Administrator or Engineer may stop by written order any work or any part of the work under this contract if, in his/her opinion, the methods employed

or conditions are such that unsatisfactory work might result. When work is so stopped it shall not be resumed until the methods or conditions are revised to the satisfaction of the Commissioner, which must be signified in writing. The Contractor agrees to make no claim for increased costs arising from the issuance of any stop work order.

11. DIMENSIONS

Figured dimensions on the plans shall be given preference over scaled dimensions, but shall be checked by the Contractor before starting construction. Any errors, omissions or discrepancies shall be brought to the attention of the Engineer and his/her decision thereon shall be final.

12. PAYMENTS TO COUNTY

Wherever in the Contract Documents the Contractor is required to make a payment to the County, the Contractor agrees that the County has the option to withhold such sum(s) from payments otherwise due to the Contractor and that all such sums withheld shall be deemed not to be earned by the Contractor.

13. PROTECTION OF UTILITIES AND STRUCTURES

The Contractor shall be responsible for the preservation of all public and private underground and surface utilities/structures at or adjacent to the construction work; insofar as they may be endangered by the work. This shall hold true whether or not they are shown on the contract drawings. If they are shown on the drawings, the County does not guarantee their locations even though the information will be from the best available sources.

The Contractor shall give ample and reasonable notice to all private, corporate or municipal owners before work is done near their utility or structure; shall properly protect all utilities/structures encountered; shall at their expense repair/replace any items that are damaged; and shall proceed with caution to prevent undue interruptions to utility services.

Investigation and/or on-site mark-out, by the County, must be done prior to excavation work at the Valhalla Campus. This investigation/mark-out is to serve as a guide for the Contractor and does not absolve the Contractor from the responsibility to repair/replace identified or non-identified utilities/structures, at no cost to the County.

All excavation work performed at the Valhalla Campus requires the submission of a completed "Ground Penetration" form/sketch(es) will be distributed to the appropriate utility owners. Therefore, the Contractor should assume that no excavation work can be performed until approximately twenty (20) working days after submission of the form/sketch(es), but not prior to approval by the DPW-BO Superintendent of Buildings.

14. PROTECTION OF WATER RESOURCES & THE ENVIRONMENT

The Contractor is responsible to review the specifications and drawings as they relate to this Agreement to ascertain what procedures must be followed in order to comply with all applicable stormwater management, water quality control, erosion, and sediment control

laws, rules, regulations and permits. If the Contractor is of the opinion that any work required, necessitated, or contained in the specifications or otherwise ordered conflicts with the applicable stormwater management, water quality control, erosion, and sediment control laws, rules, regulations, procedures, and permits, including, without limitation, all applicable provisions of the New York State Stormwater Management Design Manual, and the New York Standards and Specifications for Erosion and Sediment Control as they may be amended from time to time, it must promptly notify the First Deputy Commissioner of the Department of Public Works in writing.

In addition to all other requirements contained in this Agreement, the Contractor recognizes and understands that it is an essential element of this Agreement that the Contractor complies with the County's policies to protect water resources and the environment. The Contractor must comply with all applicable stormwater management, water quality control, erosion, and sediment control laws, rules, regulations, permits, procedures and specifications, including, without limitation, all applicable provisions of the New York State Stormwater Management Design Manual,[1], the New York Standards and Specifications for Erosion and Sediment Control as they may be amended from time to time. All of these documents should be obtained from the New York State Department of Environmental Conservation to ensure that the Contractor has the latest version. It should be noted that the standards set forth in the New York State Stormwater Management Design Manual, and the New York Standards and Specifications for Erosion and Sediment Control apply to ALL work done for the County, regardless of the size of the project. In case of a conflict among the governmental regulations and standards, the most stringent regulation, standard or recommendation shall apply to the work done under this Agreement.

The Contractor and its subcontractors shall execute the required Stormwater Pollution Prevention Certification, which is located at Proposal Page 20. In addition, the Contractor acknowledges that if the work required under this Agreement requires that a State Pollutant Discharge Elimination System ("SPDES") permit be obtained from the New York State Department of Environmental Conservation, then the Contractor must comply with the terms and conditions of the SPDES permit for stormwater discharges from construction activities and the Contractor will not take any action or fail to take any necessary action that will result in the County being held to be in violation of said permit or any other permit. The Contractor shall cooperate with the County in obtaining the permit and comply with the SPDES permit and all other applicable laws, rules, regulations and permits.

The Contractor shall provide, as the Commissioner or his designee may request, proof of compliance with the County's policies to protect water resources and the environment, and all applicable stormwater management, water quality control, erosion and sediment control laws, rules, regulations, permits, procedures and specifications.

The Contractor is responsible to ascertain which of the laws, rules, regulations, permits and standards referenced above affect its construction activities, and the Contractor shall be solely responsible for all costs and expenses, including any penalties or fines, incurred by the County, due to the Contractor's failure to comply with such applicable laws, rules,

[1] available at http://www.dec.state.ny.us/website/dow/swmanual/swmanual.html - The location of this reference is provided to assist the Contractor; it does not relieve the Contractor from the obligation of obtaining and complying with the latest version of the document.

permits, regulations, standards and County policies. The Contractor shall be responsible to defend and indemnify the County from any and all claims resulting from the Contractor's failure to comply with the applicable laws, rules, regulations, permits, standards and County policies.

Failure of the Contractor to comply with the County's policies to protect water resources and the environment, and all applicable stormwater management, water quality control, erosion and sediment control laws, rules, regulations, permits, procedures and specifications may result in the withholding of progress payments to the Contractor by the County. Such withholding of progress payments shall not relieve the Contractor of any requirements of the Agreement including the completion of the work within the specified time, and any construction sequence requirement of the Agreement.

The Contractor acknowledges that its failure to comply with the County's policies to protect water resources and the environment, and all applicable stormwater management, water quality control, erosion and sediment control laws, rules, regulations, permits, procedures and specifications shall constitute a material breach under this contract. For the breach or violation of this provision, without limiting any other rights or remedies to which the County may be entitled, the County shall have the right, in its sole discretion to suspend, discontinue or terminate this Agreement immediately upon notice to the Contractor. In such event, the Contractor shall be liable to the County for any additional costs incurred by the County in the completion of the project.

The failure of the Contractor to comply with these requirements could lead to a determination that the Contractor is not a responsible bidder when the Contractor is bidding on other projects.

15. SANITARY REGULATIONS

The Contractor shall obey and enforce such sanitary regulations and orders and shall take such precautions against infectious diseases as may be deemed necessary. The building of shanties or other structures for housing the men, tools, machinery or supplies will be permitted only at approved places, and the sanitary condition of the grounds in and at such shanties or other structures must be at all times maintained in a satisfactory manner.

16. CLEANING UP

Upon completion of the work, the Contractor shall remove all equipment, rubbish, debris and surplus materials from the buildings, and grounds, and provide a suitable dumping place for such materials. The premises shall be left in a neat, clean and acceptable condition.

No litter, debris of any kind shall be allowed to accumulate for more than one day in any portion of the buildings or grounds, and must be removed from the area at the end of each workday.

17. PREVENTION OF DUST HAZARD

In accordance with the New York State Labor Law, Section 22a, in the event a silica or other harmful dust hazard is created due to construction operations under the contract, the Contractor shall install, maintain and keep in effective operation the appliances and methods

for the elimination of such silica dust or other harmful dust as have been recommended and approved by State and local authorities.

18. REPRESENTATIVE ALWAYS PRESENT

The Contractor in case of its absence from the work shall have a competent representative fluent in English or foreman present, who shall obey without delay, all instructions of the Construction Administrator in the prosecution and completion of the work in conformity with this contract, and shall have full authority to supply labor and material immediately.

19. WORK IN BAD WEATHER

During freezing, stormy or inclement weather, no work shall be done except such as can be done satisfactorily and in a manner to secure first-class construction throughout.

20. PROTECTION OF WORK UNTIL COMPLETION

The Contractor shall be responsible for the protection and maintenance of its work until the same has been accepted by the Owner and shall make good any damage to the work caused by floods, storms, settlements, accidents, or acts of negligence by its employees or others so that the complete work when turned over to the Owner will be in first-class condition and in accordance with the plans and specifications.

21. REMOVAL OF TEMPORARY STRUCTURES AND CLEANING UP

On or before the completion of the work the Contractor shall, without charge therefore, tear down and remove all buildings and other structures built by him for facilitating the carrying out of the work, shall remove all rubbish of all kinds from the grounds which he has occupied, shall do any small amount of additional trimming and grading and shall leave the entire work and premises clean, neat and in good condition. The Contractor shall provide at its own expense suitable dumping places for such material. When the necessity for protecting traffic ends, the Contractor shall remove all signs, lighting devices, barricades and temporary railings from the site of the work.

22. GROSS LOADS HAULED ON HIGHWAY

The Contractor shall at no time during the construction of this contract, haul gross loads exceeding the legal limit prescribed by the Highway Law over the highways of access to, or the highway included in this contract.

23. CONCRETE BATCH PROPORTIONS - YIELD

No Construction Administrator or Engineer is authorized to instruct or inform the Contractor, or any of its agents or employees, or its concrete supplier as to the weights of the ingredients to be used to produce a cubic yard of concrete or as to the yield to be used to produce a cubic yard of concrete or as to the yield to be expected from any batch. The Contractor shall make its own determination and give its own instructions to its agents, employees and concrete supplier as to the total quantity of ingredients to be purchased as a

cubic yard of concrete. The right is reserved to the Construction Administrator and Engineer, however, to verify yields after batch weights have been established by the Contractor and to order a reduction in total weight per load in the event his/her calculations show that the rated capacity of truck mixers, if approved for use, will be exceeded.

24. DAMAGE DUE TO CONTRACTOR'S OPERATIONS

In the event that damage is caused to structures, surfacing, pavement, shrubbery, trees or to grassed areas through trucking operations, delivery of materials, the actual performance of the work, or other causes, the Contractor shall fully restore the same to their original condition at its own expense. In the event that more than one contractor causes damages to any one area, the Director of Project Management will apportion the amount of repair work to be done by each contractor. The decision of the Director of Project Management shall be final and binding upon the Contractor(s) and may not be challenged except pursuant to a proceeding brought pursuant to Article 78 of the Civil Practice Law and Rules.

25. PROPERTY DAMAGE

The Contractor shall not enter upon nor make use of any private property along the line of work except when written permission is secured from the owner of that property. In case of any damage or injury done along the line of work in consequence of any act or omission on the part of the Contractor, or any one in its employ, in carrying out the contract, the Contractor shall at its own expense restore the same or make repairs as are necessary in consequence thereof in a manner satisfactory to the owner of the affected property; provided, however, that the obligation thus assumed by the Contractor shall not inure directly or indirectly to the benefit of any insurer of physical damage to property or loss of use, rents or profits of property regardless of whether the insurer has actually paid the claim or made only a loan to its insured, nor to the latter if it shall waive or abandon any claim against its insurer or insurers.

In case of failure on the part of the Contractor to restore or repair such property in a manner satisfactory to the owner of the affected property, the party of the first part may upon forty-eight hours notice to the Contractor proceed with such restoration or repair. The expense of such restoration or repair shall be deducted from any monies, which are due or may become due the Contractor under its contract. The Construction Administrator shall be the sole judge as to what constitutes failure to restore or repair as above stated and service of notice by mail addressed to the Contractor at the address stated in the proposal shall be sufficient.

26. CLAIMS FOR DAMAGES

The Contractor agrees that it will make no claim against the County or any of its representatives for damages for delay, interference or disruption of any kind in the performance of its Contract and further agrees that any such claim arising from acts or failure to act of the County or any of its representatives shall be fully and exclusively compensated for by an extension of time to complete the performance of the work as provided herein.

27. EXTENSIONS OF TIME

An extension or extensions of time may be granted only by the Commissioner and only upon a verified application therefore by the Contractor. Each application for an extension of time must set forth in detail the nature of each cause of delay in the completion of the work, the date upon which each such cause of delay began and ended, and the number of days attributable to each of such causes. If the schedule for this project is based upon the Critical Path Method, the Contractor must also demonstrate that the delay for which an extension of time is sought occurred on the critical path. A formal written notice of the Contractor's intent to apply for an extension of time must be submitted to the Commissioner within seven (7) calendar days of the start of the alleged delay. The formal application for the extension of time must be submitted to the Commissioner no later than ten (10) calendar days after the end of the delay, but in no event later than the Contractor's submittal of its application for its substantial completion payment. The failure of the Contractor to timely submit either its formal written notice of its intent to apply for an extension of time or the application thereof shall be deemed a waiver of any entitlement to any extension of time.

The Contractor shall be entitled to an extension of time for delay in completion of the work caused solely (1) by the acts or omissions of the County, its officers, agents or employees; or (2) by the acts or omissions of other Contractors on this project; or (3) by supervening conditions entirely beyond the control of either party hereto (such as, but not limited to, Acts of God, excessive inclement weather, war, or any other national emergency making performance temporarily impossible or illegal, or strikes or labor disputes not brought about by any act or omission of the Contractor).

The Contractor shall not be entitled to receive a separate extension of time for each of several causes of delay operating concurrently, but, if at all, only for the actual period of delay in completion of the work as determined by the Engineer or Commissioner. If one of multiple causes of delay operating concurrently results from any act or omission of the Contractor or of its subcontractors of whatever tier, and would of itself (irrespective of concurrent causes) have delayed the work, no extension of time will be allowed for the period of delay resulting from such act or omission and the Contractor shall re-arrange his Progress Schedule and operations so as to complete the Work within the time set forth in the Contract and minimize the impact of the Work on the other Prime Contractors.

The determination made by the Commissioner or Engineer on an application for an extension of time shall be binding and conclusive on the Contractor and may not be challenged except in a proceeding commenced pursuant to Article 78 of the Civil Practice Law and Rules.

Permitting the Contractor to continue with the work after the time fixed for its completion has expired, or after the time to which such completion may have been extended has expired, or the making of any payment to the Contractor after such time, shall not operate as waiver on the part of the County of any of its rights or remedies under this contract nor shall it relieve the Contractor from his obligation under the Contract, including without limitations its liability to the County for liquidated damages, engineering costs, delays, damages, and/or costs incurred by the County.

If the Commissioner deems it advisable and expedient to have the Contractor complete and furnish the Work after the expiration of the time of Completion of Work (see "Required

Time For Completion Of The Work" of the General Requirements) and in order that the County's fiscal officers may be permitted to make payment to the Contractor for Work performed beyond that date, the Commissioner may extend the Contract solely for the purpose of enabling the Contractor to be paid for Work performed. This extension shall in no way relieve the Contractor from his obligation under the Contract, including without limitations its liability to the County for liquidated damages, engineering costs, delays, damages, attorney's fees and/or costs incurred by the County, nor shall such extension of time be asserted by the Contractor in any action or proceeding as evidence that it completed its work in a timely manner.

The time necessary for review by the Engineer of all submittals including vendors, shop drawings, substitutions, etc., and delays incurred by normal seasonal and weather conditions should be anticipated and is neither compensatory nor eligible for Extensions of Time.

When the Work embraced in the Contract is not completed on or before the date specified herein, engineering and inspection expenses incurred by the County of Westchester upon the Work from the completion date originally fixed in the Contract to the final date of completion of the Work may be charged to the Contract and be deducted from the final monies due the Contractor.

28. REQUEST FOR APPROVAL OF EQUAL

A. GENERAL REQUIREMENTS

Wherever in the Contract Documents an article, material, apparatus, product or process is called for by trade name or catalog reference, or by the name of the patentee, manufacturer or dealer, it is understood that it constitutes the standard requirement to meet the contract specifications. Where two or more articles, materials, apparatus, products or processes are listed as acceptable by reference to trade name or otherwise, the choice of these will be optional to the bidder.

Bidders may base their bid on one of the specified items, or they may base their bid on an "equal". However, the bidder should be aware that the County makes the final determination as to what constitutes an equal.

If the Engineer shall reject the proposed equal as not being the equal of that specifically named in the contract, the successful bidder (Contractor) shall immediately proceed to furnish the designated article, material, apparatus, product or process as specified or an approved equal without additional cost or time delay to the County.

B. REVIEW PROCESS

1) Within fifteen (15) days from the Notice to Proceed, requests for approval of equals must be proposed to the Commissioner on the "Request For Approval Of Equal" form of the Sample Forms. This Period for submitting requests will be strictly enforced. Such requests shall conform to the requirements of this Article.

2) Requests for approval of equals will be received and considered from Prime Contractors only and not from manufacturers, suppliers, Subcontractors, or other third parties.

3) If the materials and equipment submitted are offered as equals to the Contract

Documents the Contractor shall advise the County and the Engineer of the requested equal and comply with the requirements hereinafter specified in this Article.

4) Where the acceptability of an equal is conditioned upon a record of satisfactory operation and the proposed equal does not fulfill this requirement, the Engineer, at his/her sole discretion, may accept the equal if the Contractor provides a bond or cash deposit which guarantees replacement at no cost to the County for any failure occurring within the specified time. The equal item must meet all other technical requirements contained in the Specification.

5) The successful bidder shall furnish such information as required by the Engineer to demonstrate that the equal article, material, apparatus, product or process is the equal of that specified in quality, finish, design, efficiency and durability and has been elsewhere demonstrated to be equally serviceable for the purpose for which it is intended. The Contractor shall set forth the reasons for desiring to utilize the proposed equal.

6) Contractor shall submit:

   a. For each proposed request for approved equal sufficient details, complete descriptive literature and performance data together with samples of the materials, where feasible, to enable the Engineer to determine if the proposed request for approved equal is equal, including manufacturer's brand or trade names, model numbers, description of specification of item, performance data, test reports, samples, history of service, and other data as applicable.

   b. Certified tests, where applicable, by an independent laboratory attesting that the proposed equal is equal.

   c. A list of installations where the proposed equal equipment or materials is performing under similar conditions as specified.

7) Requests for approval of equal after the period set forth in B. REVIEW PROCESS, Paragraph 1, above will not be accepted for evaluation except in case of strikes, discontinuance of manufacturer or other reason deemed valid by the Engineer whereby the specified products or those approved are unattainable. In such case the Contractor shall provide substantial proof that the acceptable products are unavailable.

8) Where the approval of an equal requires revision or redesign of any part of Work, including that of other Contracts, all such revision and redesign, and all new drawings and details required therefore, shall be provided by the Contractor at its own cost and expense, and shall be subject to the approval of the Commissioner.

9) In the event that the Engineer is required to provide additional engineering services, then the engineer's charges for such additional services shall be promptly paid by the Contractor to the County.

10) Any modifications in the Work required under other Contracts to accommodate the changed design will be incorporated in the appropriate Contracts and any resulting increases in Contract prices will be paid by the Contractor who initiated the

changed design to the County.

11) In all cases the Engineer shall be the judge as to whether a proposed equal is to be approved. The Contractor shall abide by his/her decision when proposed equal items are judged to be unacceptable and shall in such instances furnish the item specified or indicated. No equal items shall be used in the Work without written approval of the Engineer.

12) In making request for approval of equal, Contractor represents that:

    a. Contractor has investigated proposed equal, and determined that it is equal to or superior in all respects to the product, manufacturer or method specified.

    b. Contractor will provide the same or better warranties or bonds for proposed equal as for product, manufacturer or method specified.

    c. Contractor waives all claims for additional costs or extension of time related to proposed equal that subsequently may become apparent.

    d. Contractor shall have and make no claim for an extension of time or for damages by reason of the time taken by the Engineer in considering an equal proposed by the Contractor or by reason of refusal of the Engineer to approve an equal proposed by the Contractor. Any delays arising out of consideration, approval, or utilization of an equal shall be the sole responsibility of the Contractor requesting the equal and it shall arrange its operations to make up the time lost.

13) Proposed Equal Will Not Be Accepted If:

    a. Acceptance will require substantial revision of Contract Documents.

    b. They will change design concepts or Technical Specifications.

    c. They will delay completion of the Work, or the Work of other Contractors.

    d. They are indicated or implied on a Shop Drawing and are not accompanied by a formal request for approval of equal from Contractor.

14) Only those products originally specified and/or added by approved requests for equals submitted in accordance with the preceding paragraphs may be used in the Work. Whenever requests for equals are approved, it shall be understood that such approval is conditional upon strict conformance with all requirements of the Contract and further subject to the following:

    a. Any material or article submitted for approval in accordance with the above procedure must be equal, in the sole opinion of the Engineer, to the material or article specified. It must be readily available in sufficient quantity to prevent delay of any Work; it must be available in an equivalent color, texture, dimension, gauge, type and finish as to the item or article specified; it must be equal to the specified item in strength, durability, efficiency, serviceability, compatibility with existing systems, ease and cost of maintenance; it must be compatible with the design and not necessitate substantial design modifications; it must be equal in warranties and guarantees; its use must not impose substantial additional Work, or require substantial changes in the Work of any

other Contractor. Availability of spare parts shall be assured for the useful life of the Project.

b. The Engineer reserves the right to disapprove, for aesthetic reasons, any material or equipment on the basis of design or color considerations alone, without prejudice to the quality of the material or equipment, if the manufacturer cannot meet the required colors or design.

c. All requests for approval of equals of materials or other changes from the contract requirements shall be accompanied by an itemized list of all other items affected. The Engineer shall have the right, if such is not done, to rescind any approvals for equals or changes and to order such Work removed and replaced with Work conforming to the specified requirements of the contract, all at the Contractor's expense, or to assess all additional costs resulting from the equal to the Contractor.

15) Approval of an equal will not relieve Contractor from the requirement to submit Shop Drawings or any of the provisions of the Contract Documents.

16) In the event that the Engineer is required to provide additional engineering services as a result of a request for approval of an equal of materials or equipment which are not "or equal" by the Contractor, or changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or as a result of Contractor's errors, omissions or failure to conform to the requirements of the Contract Documents or if the Engineer is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, or for evaluation of deviations from Contract Documents, then the Engineer's charges in connection with such additional services shall be paid by the Contractor to the County.

17) The Contractor shall respond to required submittals with complete information and with a degree of accuracy to achieve approvals within three (3) submissions. All costs to the Engineer involved with subsequent submissions requiring approval, will be paid by the Contractor to the County.

29. SUBSTITUTION

A. Should the Contractor desire to substitute other articles, materials, apparatus, products or processes than those specified or approved as equal, the Contractor shall apply to the Engineer in writing for approval of such substitution. It should be noted that the bid shall not be based on a substituted article, material, apparatus, product or process. With the application shall be furnished such information as required by the Engineer to demonstrate that the article, material, apparatus, product or process he wishes to use is the equivalent of that specified in quality, finish, design, efficiency and durability and has been elsewhere demonstrated to be equally serviceable for the purpose for which it is intended. The Contractor shall set forth the reasons for desiring to make the substitution and shall further state what difference, if any, will be made in the construction schedule and the contract price for such substitution should it be accepted; it being the intent hereunder that any savings shall accrue to the benefit of the County.

B. If the Engineer shall reject any such desired substitution as not being the equivalent of that specifically named in the contract, or if it shall determine that the adjustment in price in favor of the County is insufficient, the Contractor shall immediately proceed to furnish the designated article, material, apparatus, product or process.

C. Request for substitutes must be proposed to the Commissioner on the "Request For Approval Of Substitution" form of the Sample Forms. Such requests shall conform to the requirements of this Article.

D. Requests for substitutions shall include full information concerning differences in cost, and any savings in cost resulting from such substitutions shall be passed on to the County.

E. Requests for utilization of substitutes will be reviewed during the course of the project. The impact on the project and the timeliness of submission will be of key consideration.

F. The approval of utilization of a substitute is subject to the sole and final discretion of the Engineer.

G. REVIEW PROCESS

1) Requests for approval of substitutions will be received and considered from Prime Contractors only and not from manufacturers, suppliers, Subcontractors, or other third parties.

2) If the materials and equipment submitted are offered as substitutions to the Contract Documents or approved equal the Contractor shall advise the County and the Engineer of the requested substitutions and comply with the requirements hereinafter specified in this Article.

3) Where the acceptability of substitution is conditioned upon a record of satisfactory operation and the proposed substitution does not fulfill this requirement, the Engineer, at his/her sole discretion, may accept the substitution if the Contractor provides a bond or cash deposit which guarantees replacement at no cost to the County for any failure occurring within the specified time. The substitution item must meet all other technical requirements contained in the Specification.

4) The Contractor shall furnish such information as required by the Engineer to demonstrate that the equal article, material, apparatus, product or process is the equivalent of that specified in quality, finish, design, efficiency and durability and has been elsewhere demonstrated to be equally serviceable for the purpose for which it is intended and/or that it offers substantial benefits to the County in saving of time and/or cost. The Contractor shall set forth the reasons for desiring to make this substitution.

5) Contractor shall submit:

a. For each proposed request for approved substitute sufficient details, complete descriptive literature and performance data together with samples of the materials, where feasible, to enable the Engineer to determine if the proposed request for approval should be granted, including manufacturer's brand or trade names, model numbers, description of specification of item, performance data, test reports, samples, history of service, and other data as applicable.

b. Certified tests, where applicable, by an independent laboratory attesting to the performance of the substitute.

c. A list of installations where the proposed substitute equipment or materials is performing under similar conditions as specified.

6) Where the approval of a substitute requires revision or redesign of any part of Work, including that of other Contracts, all such revision and redesign, and all new drawings and details required therefore, shall be provided by the Contractor at its own cost and expense, and shall be subject to the approval of the Engineer.

7) In the event that the Engineer is required to provide additional engineering services, then the engineer's charges for such additional services shall be paid by the Contractor to the County.

8) Any modifications in the Work required under other contracts to accommodate the changed design will be incorporated in the appropriate contracts and any resulting increases in contract prices will be charged to the Contractor by the County who initiated the changed design.

9) In all cases the Engineer shall be the judge as to whether a proposed substitute is to be approved. The Contractor shall be bound by his/her decision. No substitute items shall be used in the Work without written approval of the Engineer.

10) In making request for approval of substitute, Contractor represents that:

a. Contractor has investigated proposed substitute, and determined that it is equal to or superior in all respects to the product, manufacturer or method specified or offers other specified advantages to the County.

b. Contractor will provide the same or better warranties or bonds for proposed substitute as for product, manufacturer or method specified.

c. Contractor waives all claims for additional costs or extension of time related to proposed substitute that subsequently may become apparent.

d. Contractor shall have and make no claim for an extension of time or for damages by reason of the time taken by the Engineer in considering a substitute proposed by the Contractor or by reason of failure of the Engineer to approve a substitute proposed by the Contractor. Any delays arising out of consideration, approval, or utilization of a substitute shall be the sole responsibility of the Contractor requesting the substitute and it shall arrange its operations to make up the time lost.

11) Proposed substitute will not be accepted if:

a. Acceptance will require substantial revision of Contract Documents.

b. They will substantially change design concepts or Technical Specifications.

c. They will delay completion of the Work, or the Work of other Contractors.

d. They are indicated or implied on a Shop Drawing and are not accompanied by a formal request for approval of substitute from Contractor.

12) The Engineer reserves the right to disapprove, for aesthetic reasons, any material or

equipment on the basis of design or color considerations alone, without prejudice to the quality of the material or equipment, if the manufacturer cannot meet the required colors or design.

13) All requests for approval of substitutes of materials or other changes from the contract requirements, shall be accompanied by an itemized list of all other items affected by such substitution or change. The Engineer shall have the right, if such is not done, to rescind any approvals for substitutions and to order such Work removed and replaced with Work conforming to the specified requirements of the contract, all at the Contractor's expense, or to assess all additional costs resulting from the substitution to the Contractor.

14) Approval of a substitute will not relieve Contractor from the requirement to submit Shop Drawings or any of the provisions of the Contract Documents.

15) In the event that the Engineer is required to provide additional engineering services as a result of a request for approval of a substitute results in changes by the Contractor in dimension, weight, power requirements, etc., of the equipment and accessories furnished, or as a result of Contractor's errors, omissions or failure to conform to the requirements of the Contract Documents or if the Engineer is required to examine and evaluate any changes proposed by the Contractor solely for the convenience of the Contractor, or for evaluation of deviations from Contract Documents, then the Engineer's charges in connection with such additional services shall be paid by the Contractor.

16) Structural design shown on the Drawing is based upon the configuration of and maximum loading for major items of equipment as indicated on the Drawings and as specified. If the substituted equipment furnished differs from said features, the Contractor shall pay to the County all costs of redesign and for any construction changes required to accommodate the equipment furnished, including the Engineer's charges in connection therewith.

17) The Contractor shall respond to required submittals with complete information and with a degree of accuracy to achieve approvals within two (2) submissions. All costs to the Engineer involved with subsequent submissions of Shop Drawings, Samples or other items requiring approval, will be paid by the Contractor to the County, by deducting such costs from payments due for Work completed. In the event an approved item is requested by the Contractor to be changed or substituted for, all costs involved in the reviewing and approval process will likewise be backcharged to the Contractor unless determined by the Engineer that the need for such substitution and/or deviation from Contract Documents is beyond the control of the Contractor.

30. EXTRA WORK: INCREASED COMPENSATION/DECREASED WORK: CREDIT TO THE OWNER

The Director of Project Management may, at any time, by a written order, and without notice to the sureties, require the performance of Extra Work or require or approve changes in the work, or Decreased Work ("work" to include but not be limited to specified methods of performing work) as he may deem necessary or desirable. The amount of compensation

to be paid to the Contractor for any Extra Work, as so ordered, or credit to the Owner for such decreased work, as so ordered or approved, shall be determined as follows:

1) **First**: By such applicable unit prices, if any, as set forth in the Contract; or

2) **Second**: If no such prices are so set forth, then by unit prices or by a lump sum, or sums, mutually agreed upon by the Director of Project Management and the Contractor; or

3) **Third**: If, in the opinion of the Director of Project Management, the aforesaid unit prices, under "First" above, are not applicable, or if the two parties hereto cannot reach agreement as to new unit prices or a lump sum, or sums, under "Second" above, then by the actual net cost in money to the Contractor of the materials and of the wages of applied labor (including cost of supplements provided and premiums for Workmen's Compensation Insurance, FICA, and Federal and State Unemployment Insurance) required for such Extra Work, plus twenty (20%) percent as compensation for all items of profit and costs or expenses including administration, overhead, superintendence, insurance (other than those specifically noted above) materials used in temporary structures, allowances made by the Contractor to subcontractors, including those made for overhead and profit, additional premiums upon the performance bond of the Contractor and the use of small tools and any and all other costs and expenses not enumerated above, plus such rental for plant and equipment (other than small tools) required and approved for such extra work. Where extra work is performed by a Subcontractor, the twenty percent stipulated above shall be divided between the Contractor and the Subcontractor as per their contractual agreement, or if not defined therein, then as the Contractor sees fit.

Rental rates for any power operated machinery, trucks or equipment, which it may be found necessary to use as in "Third" above, shall be reasonable and shall be based on those prevailing in the area of the County where such work is to be done, and they shall be agreed upon in writing before the work is begun.

In no case shall the rental rates submitted exceed the rates set up in the current edition of "Equipment Watch" plus the cost of fuel and lubricants.

These rates shall include all repairs, fuel, lubricants, applicable taxes, insurance, depreciation, storage and all attachments complete, ready to operate, but excluding operators. Operators shall be paid as stated here in above for labor.

For equipment, which is already on the project, the rental period shall start when ordered to work by the Construction Administrator, and shall continue until ordered to discontinue by him. The minimum payment for any one rental period shall be four hours, unless otherwise agreed upon between the Construction Administrator and the Contractor.

For equipment which has to be brought to the project, specifically for use as in "Third" above, the County will pay all loading and unloading costs, also all transportation costs will not be paid, if the equipment is used for work other than in "Third" above while on the project. The rental period shall begin at the time the equipment has been unloaded on the

project, and shall end on and include the day the order to discontinue the use of the equipment as in "Third" above is given to the Contractor by the Construction Administrator.

The daily rate shall apply for rental periods of four calendar days or less, the weekly rate shall apply for rental periods of more than four and not exceeding twenty-one calendar days, and the monthly rate shall apply for rental periods in excess of twenty-one calendar days. For fractional periods above the full unit rental period (day, week, month) reimbursement shall be proportioned on the basis of the applicable rental period. (Day-8 hrs.; Week-7 calendar days; Month-30 calendar days).

No percentage shall be added to the amounts of equipment rental prices agreed upon, but the price agreed upon shall be the total compensation allowed for the use of such equipment.

The provisions hereof shall not affect the power of the Contractor to act in case of emergency.

31. DISPUTED WORK - NOTICE OF CLAIMS FOR DAMAGES

If the Contractor is of the opinion that any work required, necessitated, or ordered violates or conflicts with or is not required by the terms and provisions of this Contract, it must promptly, within five (5) calendar days after being directed to perform such work, notify the Construction Administrator, in writing, of its contentions with respect thereto and request a final determination thereon. If the Construction Administrator determines that the work in question is contract and not extra work, or that the order complained of is proper, he will direct the Contractor in writing to proceed and the Contractor shall promptly comply. In order, however, to preserve its right to claim compensation for such work or damages resulting from such compliance, the Contractor must, within seven (7) calendar days after receiving notice of the Construction Administrator's determination and direction, notify the Construction Administrator, in writing that the work is being performed or that the determination and direction is being complied with, under protest. Failure of the Contractor to so notify shall be deemed as a waiver of claim for extra compensation or damages therefore.

While the Contractor is performing disputed work or complying with a determination or order under protest in accordance with this Article, in each such case the Contractor shall furnish the Construction Administrator daily with three copies of written statements signed by the Contractor’s representatives at the site showing:

1) the name of each worker employed on such work or engaged in complying with such determination or order, the number of hours employed thereon, and the character of the work each is doing; and

2) the nature and quantity of any materials, plant and equipment furnished or used in connection with the performance of such work or compliance with such order, and from whom purchased or rented.

It is expressly agreed that no dispute over the scope of the Contractor’s work or any portion thereof shall cause any delay or interruption to the Contractor’s work.

In addition to the foregoing statements, the Contractor shall, upon notice from the Board of Acquisition and Contract, produce for examination by the duly appointed representative of

the Board of Acquisition and Contract, all its books of accounts, bills, invoices, payrolls, subcontracts, time books, daily reports, bank deposit books, bank statements, check books and canceled checks, showing all of its acts and transactions in connection with or relating to or arising by reason of this contract, and submit itself, its agents, servants and employees for examination under oath by any duly appointed representative designated by the Board of Acquisition and Contract to investigate claims made against the County. Unless the aforesaid statements shall be made and filed within the time aforesaid and the aforesaid records submitted for examination and the Contractor, its agents, servants, and employees submit themselves for examination as aforesaid, the County shall be released from all claims arising under, relating to or by reason of this contract, except for the sums certified by the Construction Administrator to be due and agreed that no person has power to waive any of the foregoing provisions, and that in any action against the County to recover any sum in excess of the sums certified by the Construction Administrator to be due under or by reason of this contract, the Contractor must allege in its complaint and prove, at the trial, strict compliance with the provisions of this article.

Before final acceptance of the work by the County, all matters of dispute must be adjusted to the mutual satisfaction of the parties thereto. Determinations and decisions in case any question shall arise, shall constitute a condition precedent to the right of the Contractor to receive the money therefore, until the matter in question has been adjusted.

32. CONTRACTOR'S SUBCONTRACTS AND MATERIAL LISTS

Within fifteen (15) days after execution of the Contract, the successful bidder shall submit to the County for approval a list of the subcontractors, materialmen and materials that he/she plans to use in the performance of the work and statements of the work they are to perform. The format and content of the list shall be in accordance with directives from the Construction Administrator. He/sit shall also submit additional information regarding their qualifications as may be later requested by the County. No part of the work may be sublet until after the Contractor has received the County's approval.

The Contractor shall be fully responsible for all acts and omissions of its subcontractors and persons directly or indirectly employed by them, and the County's approval to sublet parts of the work will in no way relieve the Contractor of any of its obligations under the Contract. All dealings of the Construction Administrator with the subcontractors shall be through the Contractor, subcontractors being recognized by the County only as employees of the Contractor.

By executing the Agreement, the Contractor represents that the Contractor shall insert appropriate clauses in all subcontracts to bind the subcontractors to the Contractor by all applicable provisions of the Contract Documents executed between the Contract and the County, but this shall not be construed as creating any contractual relationships between subcontractors and the County. Prior to approval of the subcontractors, the County has the right to review and recommend changes in the subcontracts. The County reserves the right to reject any subcontractor proposed by the Contractor if in the reasonable opinion of the County such subcontractor lacks the experience, capability or integrity to perform its subcontract work or is otherwise non-responsible.

By executing the Agreement, the Contractor represents that the Contractor shall insert appropriate clauses in each subcontract that require that if the Contractor is terminated by the County either for default or convenience that at the sole option of the County the subcontract shall automatically attorn to the County and the subcontractor shall continue without delay or interruption to fully perform all of the obligations required by its subcontract.

Where the specifications permit the Contractor a choice of different materials or manufactured products, it shall state the choice he has made in making up its bid, with the understanding that all choices must subsequently be approved by the Commissioner, after award of the contract to the successful bidder. If the bidder wishes to propose utilization of materials or manufactured products other than those specified, it shall so state and submit the required information in accordance with Article "Request For Approval Of Equal" of the General Clauses."

33. ASSIGNMENT OF CONTRACT

The Contractor shall not assign, transfer, convey or otherwise dispose of the contract or any part of it or any monies due and payable under the contract, without prior written approval of the County. If such approvals are granted by the County, they shall in no way relieve the Contractor or from any obligations under the terms of this Contract.

All documents assigning the contract or any part of it or any monies due and payable under the contract shall contain a clause stating that all monies to be paid the assignee in accordance with the terms of the Contractor's contract with the County, are subject to a prior lien for services rendered or materials and equipment supplied, in favor of all persons, firms or corporations rendering such services or supplying such materials and equipment.

34. PAYMENT FOR GENERAL PROVISIONS

No direct payment will be made for work done or materials furnished in compliance with the General Provisions of the specifications, unless otherwise noted. All compensation to the Contractor for its performance of the requirements of any general provision shall be considered to have been included in the prices he has bid for the individual items if a unit price contract and/or for a lump sum price if a lump sum contract.

In the event the Contractor fails or refuses to proceed with its work and/or correct or repair deficient or defective work then without prejudice to any and all of the County's other rights and remedies, and upon three (3) days notice to Contractor, the County may perform and/or employ any other person or persons to correct and/or repair any or all such work. All costs incurred by the County pertaining thereto shall be paid forthwith by the Contractor to the County.

35. COSTS INCURRED BY COUNTY

Wherever in these Contract Documents the County is entitled to recover costs from the Contractor or charge the Contractor for the costs incurred for the correction, supervision or for any other reason related to the Contractor's work or arising from the Contractor's failure or refusal to proceed with its work in a timely manner, such costs and/or charges shall be

deemed to include, but not be limited to, the County's costs and fees for inspection(s), engineering, consultant(s) and attorneys.

36. GUARANTEE OF WORK

A. Except as otherwise specified, all work performed under the Contract shall be guaranteed by the Contractor against defects resulting from the use of inferior materials, equipment or workmanship for one year from the guarantee starting date (which shall be defined as the date of the County's approval of the final Certificate for Payment or the date of actual full occupancy of the building, whichever is earlier). The building, section thereof, or item of equipment, shall be occupied or put into actual use by the Owner only after judged completed by the Construction Administrator and Owner and approved by him as ready for occupancy.

B. If, within any guarantee period, repairs or changes are required in connection with guaranteed work, which in the opinion of the Construction Administrator or Owner is rendered necessary as a result of the materials, equipment or workmanship which are inferior, defective, or not in accordance with terms of the Contract, the Contractor shall promptly upon receipt of notice from the Construction Administrator or Owner and without expense to the Construction Administrator or Owner:

   1) Place in satisfactory condition, in every particular, all of such guaranteed work, correct all defects thereof, and

   2) Make good all damages to the building or site, or equipment or contents thereof, and

   3) Make good any work or material, or equipment and contents of said building or site disturbed in fulfilling any such guarantee.

C. In any case where in fulfilling requirements of the Contract or of any guarantee embraced in or required thereby the Contractor disturbs any work, it shall restore such disturbed work to a condition satisfactory to the Construction Administrator.

D. If the Contractor, after notice, fails to proceed promptly to comply with terms of its guarantee, the Owner may have the defects corrected and the Contractor shall be liable for all expenses incurred.

E. All special guarantees applicable to definite parts of the work that may be stipulated in the Specifications or other papers forming a part of the Contract shall be subject to the requirements and term of this article.

37. SEPARATE CONTRACTS

A. Contractor's attention is specifically directed to the fact that, because of the work of other contracts within and adjacent to the limits of this Contract they may not have exclusive occupancy of the territory within or adjacent to the limits of this Contract.

B. Contractor's attention is further directed to the fact that, during the life of this Contract the owners and operators of Public Utilities may make changes in their facilities. These changes may be made by the Utility employees or by contract within the limit or adjacent to these contracts and may be both temporary and permanent.

C. Contractor shall be required to cooperate with other contractors and the owners of the various utilities, and to coordinate and arrange the sequence of their work to conform to the progressive operations of the work already under contract and to be put under contract.

D. Contractor shall be responsible for the coordination of the work of their various subcontractors. Their respective operations shall be arranged and conducted so that delays will be avoided. Where the work of a subcontractor overlaps or dovetails with that of other subontractors, materials shall be delivered and operations conducted so as to carry on the work continuously in an efficient and workmanlike manner. Delays or oversights on the part of Contractor or its subcontractors or utility owners in getting any or all of their work done in the proper way thereby causing cutting, removing and replacing work already in place, shall not be the basis for claim for extra compensation.

E. In case of interference between the operations of the utility owners and different Contractors, the Construction Administrator will be the sole judge of the rights of each Contractor and the sequence of work necessary to expedite the completion of the entire project, and in all cases the Construction Administrators decision shall be accepted as final and may not be challenged except in a proceeding brought pursuant to Article 78 of the Civil Practice Law and Rules.

38. COOPERATION WITH OWNER

Each Contractor shall cooperate with the Owner as to parking of vehicles, availability of storage and working areas and confining of activities and personnel to same. **NO PARKING FOR CONTRACTOR'S EMPLOYEES**.

39. JOB MEETINGS & PROJECT SUPERINTENDANT

A. An officer of the Contractor, or its project manager or superintendent, who is fluent in English and authorized to make binding decision on behalf of the Contractor shall attend job meetings with the Commissioner and/or the Construction Administrator, and any subcontractors whom the Inspector may designate; for the purpose of discussing expedition, execution and coordination of the work.

B. Job meetings will be scheduled periodically (the first to be prior to commencement of construction) at a time and place designated by the Construction Administrator.

C. The Contractor shall not commence any work prior to the first (pre-construction) meeting between the Contractor, Commissioner and/or Construction Administrator, client, and other concerned governmental and utility company representatives.

D. At the pre-construction meeting, the scheduling of the work on an arrow-flow diagram (showing chronologically and in detail the sequence and methods that will be followed) will be provided, and details for the proper execution and special requirements of the work will be explained and discussed.

E. The Contractor shall be responsible for providing a detailed construction schedule that provides for a Critical Path Method (“CPM”) and which is compatible with any of the state of the art CPM Method scheduling software.

F. Updated coordinated arrow-flow diagrams or CPM schedules, as the case may be, will be provided by the Contractor, as above, on a monthly basis to the County.

The Contractor shall indicate on the construction schedules noted above, time for shop drawing preparation, approvals, fabrication and delivery of materials and equipment for major items. The County may request that additional important items be included on the schedule.

G. The Contractors hall ensure that its Project Superintendent shall be on site full time at all times when the Contractor's Work is being performed.

40. PATENT WARRANTY

A. Contractor expressly represents, warrants and agrees that he has the legal right to furnish and install and to authorize the County to purchase and use the equipment hereby offered and each and every one of its several parts and every feature thereof, under one or the other, or partly under one and partly under the other of the following representations.

1) That the Contractor possesses a valid patent(s) covering the equipment to be furnished hereunder or part or features thereof or has or will obtain permit(s) and license(s) authorizing the Contractor to furnish and install same and to authorize the purchase and use thereof by the County.

2) The Contractor is responsible before ordering material, equipment, parts, systems, etc, to verify that the suppliers of all such material, equipment, parts, systems, etc, will supply the required warranty, guarantee, O & P manual, and maintenance service schedule.

3) That the equipment offered or certain parts or features thereof are not covered by any valid patent(s) within the knowledge of the Contractor.

B. Contractor further warrants and agrees that if any patent(s) is hereafter issued to any person whatsoever with respect to the equipment or any part or features thereof, to be furnished and installed hereunder, the Contractor will obtain such permit(s) or license(s) from the Patentee as may be necessary to authorize the use of the equipment by the County.

C. Contractor further represents, warrants and agrees that he and its sureties shall hold themselves responsible for and defend any claims made against the County for any infringement of patents due to the purchase and use by the County of said equipment or any part or feature thereof; that they will indemnify and save harmless the County from all costs, expenses and damages which it shall be obliged to pay by reason of any such infringement of patent(s); that in case the use of any such equipment is enjoined, they will bear the expenses of removing same and replacing same with equipment which will satisfactorily perform the function without constituting an infringement of any patent(s); and in case the use of any equipment shall be enjoined, that they shall pay to the County the sum of $1,000.00 per day, as liquidated damages, for each and every day during which the County shall be enjoined from using the same up to the day on which such

equipment is replaced by other equipment which will satisfactorily perform the same function but which will not constitute an infringement of any other patent(s).

D. The Contractor further agrees in the event the use of any of the equipment is enjoined and the Contractor is unable within a reasonable time to devise other equipment which will satisfactorily perform the same functions without infringement on any patent(s), that he will remove the equipment and refund to the County the entire cost of its purchase and installation, plus the sum of $ 1,000.00 per day as liquidated damages for each and every day until the substitute equipment has been purchased and installed by the County, excepting however that such period shall not exceed three months.

E. The Contractor further agrees in the event that any claim or notice of claim for infringement of patent(s) are made or filed prior to the making of payment by the County for the equipment and/or material proposed to be furnished and installed hereunder, that the County may withhold any sum due to the Contractor for such equipment and/or material until such claims shall have been settled or adjudicated or until additional surety bonds or other guarantees of indemnification shall have been posted, if deemed necessary by the County for its protection.

41. MATERIALS

A. Quality

1) It is the intent of these Specifications to describe definitely and fully the character of materials and workmanship required with regard to all ordinary conditions of the work and to require first-class work and new and best quality materials in all particulars. For unexpected conditions arising during the progress of the work and not fully covered herein, the Specifications shall be interpreted by the Construction Administrator to require first-class work and materials and such interpretations shall be accepted by the Contractor.

2) The Contractor is responsible before ordering material, equipment, parts, systems, etc, to verify that the suppliers of all such material, equipment, parts, systems, etc, will supply the required warranty, guarantee, O & P manual, and maintenance service schedule.

3) Where materials or devices are specified in these documents by reference to government, manufacturer's association, or professional society standards, the pertinent sections of the latest edition of such standards shall have the same force and effect as if set forth in full in these Specifications. The following abbreviations shall be used as indicated for the principal societies:

AASHO	American Association of State Highway Officials
ACI	American Concrete Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute

ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWI	American Woodworking Institute
AWS	American Welding Society
BHMA	Builders Hardware Manufacturers Association
CS	Commercial Standards
FS	Federal Specifications
IEEE	Institute of Electrical and Electronic Engineers
NEC	National Electric Code
NEMA	National Electrical Manufacturer's Association
NFPA	National Fire Protection Association
SDI	Steel Deck Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Incorporated
TCA	Tile Council of America, Incorporated
TMCA	Tile and Marble Contractors of America
UL	Underwriter's Laboratories, Incorporated

B. Delivery, Storage and Handling:

1) Materials shall be delivered in manufacturer's original sealed containers with complete identification of contents and manufacturer, and kept sealed in original containers until used. Labels shall not be removed until materials have been installed and inspected.

2) Materials shall be delivered, stored, and handled with proper equipment and in a manner to protect them from damage.

3) The Contractor shall make arrangements for the receipt of materials delivered to the construction site. No representative of the County will accept any materials ordered by the Contractor.

4) Finish materials shall be protected from dirt and damage, and perishable materials shall be stored within appropriate weatherproof enclosures.

5) Delivery of materials shall be coordinated with the Operations Schedule.

6) The Contractor shall confine the apparatus, the storage of materials and the operations of the workmen to the limits indicated by law, ordinances, permits, or directions of the Construction Administrator, and shall not encumber the premises beyond the contract limits.

7) The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.

8) Whenever the Contract Documents require delivery by the Contractor of any materials, equipment, or other items, the term delivery shall be deemed to include unloading and storing with proper protection where directed.

C. Federal Regulations

1) Should the Federal Government, because of Declaration of an Emergency, or other cause, establish controls over the use of certain construction materials, then the Contractor, immediately after signing the Contract or immediately after Declaration of an Emergency, shall furnish the Commissioner with an itemized list of all critical materials required for use on the project. For each item, the quantity required and the approximate date on which delivery will be required shall be indicated.

D. Name Plates

1) Each piece of operable equipment to be furnished and installed by a Contractor under its Contract such as motors, pumps, heaters, fans, transformers, switch and fuse racks and other similar equipment shall be provided with a substantial name plate of non-corrodible metal securely fastened in place and clearly and permanently inscribed with the manufacturer's name, the model or type designation, the serial number, the principal rated capacities, the electrical or other power characteristics and other similar and appropriate information.

2) Manufacturer's identification shall be inconspicuous, but where nameplates contain information relative to characteristics or maintenance, they shall be clearly visible and located for easy access.

3) The nameplate of a subcontractor or a distributor will not be permitted.

E. Manufacturer's Certification

1) Prior to the delivery of any water or sewer pipe to the construction site, the Contractor shall furnish properly attested documents certifying as to the type, class, name of manufacturer and source of supply of the pipe. One copy of each document shall be forwarded to the Construction Administrator at the construction site and to the Director of Project Management care of the Engineering Division, Michaelian Office Building, White Plains, New York.

F. Samples

1) The Contractor shall furnish, for approval of the Engineer, any samples required by the specifications or that may be requested by the Owner, of all materials he proposes to use, and shall pay all shipping charges for the samples. The Contractor shall send all samples to the office of the Engineer, except when directed otherwise. The sample of approved material will remain on file in the Engineer's office. A disapproved sample will be returned to the Contractor.

2) No samples are to be submitted with bids.

3) No materials or equipment of which samples are required to be submitted for

approval shall be used on the work until such approval has been given by the Engineer or Construction Administrator, save only at the Contractor's risk and expense.

4) Each sample shall have a label indicating the material represented, its place of origin and the names of the producer, the Contractor and the Contract for which the material is intended.

5) Approval of any sample shall be only for characteristics or for uses named in such approval, and no other. No approval of a sample shall be taken in itself to change or modify any Contract requirement. When a material has been approved, no additional sample of that material will be considered and no change in brand or make will be permitted. Approved samples held by the Engineer will be returned to the Contractor upon completion of the work, if requested.

6) Transactions with manufacturers or subcontractors shall be through the Contractor.

G. Dissimilar Materials

1) Where metals are placed in contact with or fastened to dissimilar metals, concrete, masonry, wood or other absorptive materials subject to repeated wetting or wood treated with a preservative non-compatible with the metal or if drainage from dissimilar materials passes over the work; treat the contact surfaces with a heavy coat of approved alkali-resident bituminous paint.

2) Where one of the metals is aluminum, a coat of zinc-chromate primer shall be applied prior to the bituminous paint.

42. STANDARD OF QUALITY

Wherever in the contract documents an article, material, apparatus, device, product or process is called for by trade name or catalog reference, or by the name of the patentee, manufacturer or dealer, it shall be construed as establishing a standard of quality and not construed as limiting competition. In such instances, the Contractor may use any article, material, etc. which, in the judgment of the Engineer, expressed in writing, is equal to and acceptable for the intent specified.

43. PROPRIETARY ITEM

Whenever less than three names are used in proprietary item specifications, it has been determined that:

A. The use of trade names is necessary for effective and workable specifications for the item.

B. All manufacturers known by the individuals familiar with the trade involved have been listed.

C. Equal items may be approved in accordance with Article “Request For Approval Of Equal” of the General Clauses.

44. SHOP DRAWINGS

A. Shop Drawing Schedule

1) Within fifteen (15) days after the Notice to Proceed, the Contractor shall prepare and submit two (2) copies of its schedule of Shop Drawing submissions to the Engineer for review and approval. The schedule is to be submitted on the "Shop Drawing Schedule" form of the Sample Forms.

2) In order to maintain the construction schedule for this project the Contractor shall submit all Shop Drawings per approved schedule. The Contractor is expressly cautioned that its failure or refusal to timely submit a shop drawing schedule acceptable to the Engineer and/or any deviation from the approved shop drawing schedule shall be deemed a default under this Contract.

3) Shop Drawings shall be submitted without fail in time to permit correction, resubmission and final approval, as hereinafter specified, without causing any delay in the construction of any Work.

4) Samples and Shop Drawings, which are related to the same unit of Work or Specification Section, shall be submitted at the same time. If related Shop Drawings and Samples are submitted at different times, they cannot be reviewed until both are furnished to the Engineer.

5) The schedule shall be updated every four-(4) weeks or more frequently as required by the Engineer.

6) Two (2)-updated copies of the schedule shall be submitted to the Engineer with each application for Partial Payment.

7) Form of Schedule

Schedule shall be in tabular form with appropriate spaces to insert the following information for principal items of equipment and materials:

a. Date on which Shop Drawings are requested and received from the manufacturer.

b. Dates on which Shop Drawings are transmitted to the Engineer by the Contractor.

c. Dates on which Shop Drawings are returned by the Engineer for revisions.

d. Dates on which Shop Drawings are revised by manufacturer and resubmitted to the Engineer.

e. Date on which Shop Drawings are returned by Engineer annotated either "Approved" or "Approved as Noted".

f. Date on which accepted Shop Drawings are transmitted to manufacturer and Contractor's Invoice Number.

g. Date of manufacturer's scheduled delivery.

h. Date on which delivery is actually made.

i. Sample of schedule follows on next page.

B. Shop Drawing Requirements

1) Shop Drawings for the Work shall include working and setting drawings, schedules, shop details, wiring diagrams, manufacturer's catalog cuts and brochures and all other drawings, schedules and diagrams necessary for the proper correlation of the Work.

Insofar as it is practicable, all drawings shall be uniform in size. They shall be dated, numbered consecutively and shall be identified with the Contract Number and Title, a description of the material or equipment and the area of the work and where it is to be installed. Shop drawings shall accurately and clearly show sizes, work, erection dimensions, arrangement and sectional views, necessary details including information for making connection with the work of other items as may be required, materials and finishes, detailed parts lists, and performance characteristics and capacities as may be required.

2) All detailing for structural components shall be done in accordance with the provisions for design and workmanship in the latest additions of the publications listed below except as may be modified in the Contract Documents:

a. "Manual of Steel Construction" of the America Institute of Steel Construction.

b. "Building Code Requirements for Reinforced Concrete" and "Manual of Standard Practice for Detailing Reinforced Concrete Structures" of American Concrete Institute.

3) Detailing practices for other components shall be done to conform to the best trade practices.

4) Contractor Responsibilities

a. Before submitting Shop Drawings to the Engineer all submittals from its Subcontractors, manufacturers or suppliers shall be sent directly to the Contractor for preliminary review, coordination and checking.

Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of material or equipment. Contractor shall thoroughly check all drawings for accuracy and conformance to the intent of the Contract Documents. Drawings found to be inaccurate or otherwise in error shall be returned to the Subcontractors, manufacturers, or suppliers by the Contractor for correction.

b. All submittals, including Shop Drawings prepared by or under the direction of the various Contractors, shall be thoroughly checked by the Contractor for accuracy and checked by the Contractor for accuracy and conformance to the intent of the Contract Documents before being submitted tot he Engineer and shall bear the Contractor's signature certifying that they have been so checked. Before submitting them to the Engineer, all submittals shall be properly labeled and consecutively numbered. In a clear space above the title block, the Contractor shall provide the "Shop Drawing ID" form of the Sample Forms, and enter the required information:

c. Shop Drawings shall be submitted as a single package including all associated drawings for any operating system and shall include all items of equipment and any mechanical units involved or necessary for the functioning of such system. Where applicable, the submittal shall include elementary wiring diagrams showing circuit functioning and necessary interconnecting wiring diagrams for construction.

d. If the submittals contain any departures from the Contract Documents, specific mention thereof shall be made in the Contractor's letter of transmittal. Otherwise, the review of such submittals shall not constitute approval of the departure. The Contractor shall also call the Engineer's attention to any changes by the use of larger letters of at least 1" in height on the Shop Drawings along with a letter by the Contractor advising the Engineer to the recommended change and the reason therefore. If this is not done, even if the Work is incorporated in the construction, it will not be accepted by the Engineer even if Shop Drawings are "Approved".

e. No materials or equipment shall be ordered, fabricated or shipped or any Work performed until the Engineer returns to the Contractor the submittals herein required, annotated "Approved".

f. Where errors, deviations, and/or omissions are discovered at a later date in any of the submittals, the Engineer's prior review of the submittals does not relieve the Contractor of the responsibility for correcting all errors, deviations and/or omissions.

g. Two (2) copies of Preliminary Operations and Maintenance Manuals shall be submitted with the final Shop Drawings for each item of equipment.

h. Submittals shall be transmitted in strict compliance with Special Clause 10. A.2 and in sufficient time to allow the Engineer adequate time for review and processing so as not to delay the Project per the approved Shop Drawing Schedule.

i. Contractor shall transmit five (5) prints of each submittal to the Engineer for review. Any submissions, which in the opinion of the Engineer, are not legible will not be reviewed and will be returned to the Contractor annotated "Disapproved".

j. Contract drawings are for engineering and general arrangement purposes only and are not to be used as Shop Drawings.

k. Shop Drawings shall accurately and clearly present the following:

- All working and installation dimensions.
- Arrangement and sectional views.
- Units of equipment in the proposed positions for installation, details of required attachments and connections, and dimensioned locations between units and in relation to the structures.
- Necessary details and information for making connections between the

various trades including, but not limited to, power supplies and interconnecting wiring between units, accessories, appurtenances, etc.

l. Structural and all other layout drawings prepared specifically for the Project shall have a plan scale of not less than 1/4-inch equal to 1 foot and they shall be not larger than the size of the Contract Drawings.

m. Where manufacturer's publications in the form of catalogs, brochures, illustrations, compliance certificates, or other data sheets are submitted in lieu of prepared Shop Drawings, such submissions shall specifically indicate the item for which approval is requested. Identification of items shall be made in ink, and submissions showing only general information are not acceptable.

n. The Contractor shall provide all required copies for the use of the various trades and at the Site, and one (1) copy of approved Shop Drawings shall be provided by the Contractor to each of the other Prime Contractors unless otherwise noted in writing by the Engineer.

o. The Contractor shall respond to required submittals with complete information and accuracy to achieve required approvals within three (3) submissions. All costs to the Owner involved with subsequent submissions of Shop Drawings, Samples or other items requiring approval, will be backcharged to the Contractor, at the rate of 3.0 times direct technical labor cost, by deducting such costs from payments due for Work completed. In the event an approved item is requested by the Contractor to be changed or substituted, all involved costs in the review process will likewise be paid by the Contractor to the County unless determined by the Director of Project Management or Commissioner that the need for such deviation is beyond the control of the Contractor. Contractor shall be responsible for coordinating its Work and submittals with its Subcontractors.. Should Contractor cause the need for additional submissions or reviews of previous submissions all involved costs will similarly be paid to the County.

5) Procedure for Review

a. Shop Drawings will be checked for design conformance with the Contract Documents and general arrangement only.

b. Submittals will be annotated by the Engineer in one of the following ways:

- "Approved" - no exceptions are taken.
- "Approved as Noted" - minor corrections are noted and shall be made and a resubmittal is required.
- "Disapproved because" - with specific deficiencies noted.
- "Disapproved" - based on the information submitted, the submission is not in conformance with the Contract Documents. The deviations from the Contract Documents are too numerous to list and a completely revised submission of the proposed equipment or a submission of other equipment is required.

c. One copy of the reviewed submittals will be returned to the Contractor. It is the Contractor's responsibility to provide copies to:

- Its Subcontractors.
- Its Materialmen and Suppliers.

unless notified otherwise in writing by the Engineer.

6) Disapproved drawings will be returned to the Contractor for correction and resubmission. After the Contractor has had the required corrections made on the original drawing, it shall again submit five copies for review by the Engineer.

7) The acceptance of Shop Drawings by the Engineer shall be only general in nature and shall not relieve the Contractor of any responsibility for the accuracy of the drawings, the proper fitting and construction of the Work or for the furnishing of materials or other Work required by the Contract Documents, but not shown on the Shop Drawings. Acceptance of Shop Drawings by the Engineer shall not be construed as approving departures from the Contract requirements unless specifically noted by the Engineer. Acceptance of Shop Drawings for one item shall not be construed as approval for other changes even if noted by the Contractor on the drawing.

8) Shop Drawings submitted other than in accordance with the outlined procedures will be returned to the Contractor for resubmission and the Contractor shall bear all expense and risk of all delays as if no Shop Drawings had been submitted.

9) No Work shall be performed until the Shop Drawings have been accepted by the Owner, and the Contractor shall be responsible for all costs and damages, which may result from proceeding prior to the approval of the Shop Drawings.

45. SEQUENCE OF CONSTRUCTION OPERATIONS

A. It is mandatory that the premises continue to be occupied and facilities therein shall continue to function during the performance of the construction work.

B. Detailed sequence of construction and availability of spaces in areas through which services must pass shall be coordinated between the Owner and the Contractor, before actual commencement of the Work.

1) To enable the Work to be laid out and prosecuted in an orderly and expeditious manner, Contractor shall provide a proposed Progress Schedule, within fifteen (15) days after the issuance of the Notice to Proceed of this Contract unless otherwise directed in writing by the Construction Administrator. The proposed Progress Schedule shall show the anticipated time of commencement and completion of each of the various operations to be performed under this Contract; together with all necessary and appropriate information regarding the sequence and correlation of Work; and the Schedule of Shop Drawings and delivery of all materials and equipment required for the Work. The Contractor shall prepare a Master Progress Schedule (Schedule) for the Work. Contractor as directed by the Construction Administrator shall revise the proposed Schedule until each activity is properly sequenced to provide that the Work will be completed in the proper order and

within the allotted Contract duration, without any conflicts. When the Construction Administrator has accepted the Schedule the Contractor will sign it. The Contractor shall then provide one (1) copy of such approved Schedule to each Subcontractor and two (2) copies to the Construction Administrator. Contractor shall afford its Subcontractors a reasonable opportunity for the introduction and storage of their materials and the execution of their Work and shall properly connect and coordinate its Work with others.

Contractor shall strictly adhere to the Schedule unless changed as provided for in the following paragraph.

2) Within five (5) days after receiving notice of any change in the Contract, or of any Extra Work to be performed, or of any suspension of the whole or any portion of the Work, or of any other conditions which are likely to cause or are actually causing delays, Contractor must notify the Construction Administrator in writing of the effect, if any, of such change or Extra Work or suspension or other condition upon the previously approved schedule, and must state in what respects, if any, the Schedule should be revised, with the reasons therefor. These proposed changes in the Schedule shall be reviewed and, if appropriate, approved, in writing, by the Construction Administrator. Contractor must strictly adhere to the revised Schedule. Distribution of the revised Schedule shall be as described in paragraph B-1 above. Contractor's compliance with the requirements of this paragraph is in addition to, and not in lieu of, compliance with other notice requirements pertaining to delays and extensions of time contained elsewhere in the contract.

3) The Schedule shall be reviewed by Contractor every two (2) weeks or as directed by the Construction Administrator.

4) If Contractor shall fail to adhere to the approved Schedule, or to the Schedule as revised, they must promptly adopt additional means and methods of construction with no additional cost to the County that will make up for the lost time and will assure completion in accordance with such Schedule. The proposed means and methods shall be described in writing to the County within two (2) days after the Contractor discovered or should have reasonably discovered that the Schedule would not be met as originally proposed. Failure to comply with this requirement may result in the County enforcing its rights under the Contract including, without limitation, default of the Contract.

C. From time to time as the Work progresses and in the sequence indicated by the approved Schedule, the Contractor must submit to the Construction Administrator a specific request in writing for each item of information or approval required. These requests shall be submitted sufficiently in advance of the date upon which the information or approval is actually required by the Contractor to allow for the time the Construction Administrator may reasonably take to act upon such submissions or resubmissions. The Contractor shall not have any right to an Extension of Time on account of delays due to its failure to timely submit requests for the information or approvals.

D. Certain construction work shall be required, which will be disruptive to the Owner's staff insofar as noise, dirt and dust is concerned. The Contractor, therefore, shall

perform such work during other than normal working hours. Subject to the requirements of law, the Owner imposes no limitation on the Contractor's working hours and whatever overtime work may be necessary or required shall be considered by the Contractor and reflected in its Bid Proposal without the benefit of extra compensation.

46. PROTECTION

A. The Contractor shall at all times exercise all necessary precautions for the safety of the public, employees performing the work and County personnel. The Contractor shall provide and maintain barricades, danger signals and other safeguards about the work and shall be held responsible for all accidents or damages to persons or property caused by failure to do so throughout the progress of the work, and shall comply with all applicable provisions of Federal, State and County Safety Laws.

B. The Contractor shall during the performance of its work, protect at all times all adjacent portions of the existing surfaces and existing equipment from damage due to the performance of the construction work.

C. The Contractor shall furnish temporary facilities and/or temporary dust-proof partitions separating all work areas and access routes from those areas not involved in active alterations, so that this work will not interfere with the Owner's access or normal use of areas not allocated to the Contractor, or any essential service to such areas, when ordered by the Construction Administrator.

47. CLEANUP AND REMOVAL OF DEBRIS

A. At the end of each working day, the Contractor shall sweep up and collect all the rubbish and place it in appropriate containers, furnished by the Contractor. Containers shall be kept at a location on, or adjacent to the work site, as designated by the Construction Administrator. Wood or cardboard crates and other debris of a similar nature shall be broken up, securely bundled and neatly stacked alongside the containers. Once each week and at the completion of the work, the Contractor shall remove all accumulated debris and rubbish.

B. At the completion of the work, the Contractor shall clean all equipment, fixtures, surfaces and accessories, removing all dust and other foreign matter, ready for use by the Owner.

48. TEMPORARY SERVICE

A. Sanitary facilities will be provided by the Owner for the Contractor and its personnel.

B. The Owner will supply and pay for the cost of all-temporary water and temporary electric power (120 volt, 60 hertz). The Contractor shall furnish and install all temporary electrical and water connections required for work under this Contract, at and to locations as designated by the Construction Administrator.

49. OPERATING TESTS

A. Where operating tests are specified the Contractor shall test the work as it progresses and shall make satisfactory preliminary tests in all cases before applying to the Engineer for official tests.

B. Official tests will be made in the manner specified for the different branches of the work, in the presence of the Construction Administrator or Engineer. Should defects appear they shall be corrected by the Contractor and the test repeated until the installation is acceptable to the Construction Administrator or Engineer and to any authorities having jurisdiction.

C. No work of any kind shall be covered or enclosed before it has been tested and approved.

D. The Contractor shall furnish all materials and apparatus, make connections and conduct tests, without extra compensation unless noted otherwise.

50. OPERATING INSTRUCTIONS AND PARTS LISTS

A. Where the Specifications require any Contractor to supply equipment operating and maintenance instructions and spare parts lists prior to the completion of the work it shall provide three copies of the publications for each piece of equipment he has furnished and installed under the Contract, upon receipt of the approved shop drawings.

B. Publications shall be prepared for the specific equipment furnished and installed, containing the following information, and shall not refer to other sizes, types or models of similar equipment:

1) Clear and concise instructions for the operation, adjustment, lubrication and other maintenance of the equipment, including a complete lubrication chart.

2) A complete listing of all parts for the equipment, with catalog numbers and other data necessary for ordering replacement parts.

C. Advertising literature will not be acceptable.

51. CUTTING AND PATCHING

Contract with Single Bid:

A. Where the project does not involve separate bids pursuant to the New York General Municipal Law the following will apply:

1) Where walls, floors, ceilings, roofs or other items require cutting for the installation of new work, all such cutting shall be done by the Contractor with the approval of the Construction Administrator; and the Contractor shall patch the opening to make the cut portions match the adjacent finished surfaces, unless otherwise indicated.

2) The Contractor shall not endanger any existing condition by its operations.

3) The cost of all cutting and patching caused by the Contractor's negligence shall be

borne by the Contractor.

Contract with Separate Bids:

B. If the project is one where separate bid specifications are required pursuant to the New York General Municipal Law the following will apply:

1) A sufficient time in advance of the construction of new floors, walls, ceilings, roofs, or other items, each Contractor shall be responsible for properly locating and providing in place all sleeves, inserts and forms required for their work, and shall furnish the Contractor for General Construction with complete information relative to exact locations and dimensions of all required openings in the General Contractor's work. Other Contractors shall periodically consult the Job Progress Chart of the General Contractor so that they will not be delayed by their work requirements, but the General Contractor shall be obliged to give all other Contractors at least seventy-two hours notice before commencing the previously mentioned new construction work.

2) The cost shall be borne by the responsible Contractor for all cutting, patching, re-waterproofing and re-caulking of new work necessary for reception of the work of a Contractor, caused by the Contractor's failure to timely or properly locate and provide in place all sleeves, inserts and forms required for its own work, or by a Contractor's failure to inform the General Contractor of required openings. The General Contractor shall do all cutting, patching, re-waterproofing and re-caulking of all new work no matter how or by whom such work was caused and shall be reimbursed for such extra work by the responsible Contractor, in accordance with the terms of the Contract. All cutting and patching shall have prior approval of the Construction Administrator.

3) Where sleeves, inserts, forms or openings are required in existing walls, floors, ceilings roofs, or other existing items, all necessary cutting, patching, re-waterproofing and re-caulking required shall be done by the individual responsible Contractor, except for finished surfaces. The responsible Contractor shall do all rough patching to bring the cut areas to the proper surface ready to receive the finished surface. All finishing work required to make the cut portions match the adjacent finished surfaces shall be performed by the General Contractor.

4) Each Contractor shall be responsible for coordinating their work with the work of all other Contractors engaged on the project. If directed, Contractors shall submit coordinated shop drawings showing how the fitting of the various parts of the work will be accomplished, for the Construction Administrator’s acceptance.

5) All cutting and patching shall be governed by the applicable divisions of the Specifications with regard to workmanship, materials and methods.

6) No Contractor shall endanger any work by unauthorized cutting, excavating, or other alteration of the work, unless previously authorized by the Construction Administrator.

52. CONFLICTS AMONG CONTRACT DOCUMENTS

In the event of any conflict among the Contract Documents, the Contractor shall notify the Commissioner and comply with the Commissioner's interpretation, according to the following priorities:

Priority Order	Document
1…….	Modification issued after execution of Agreement
2…….	Agreement between Owner and Contractor
3…….	Addenda issued prior to the execution of the Agreement (Later date to take precedence)
4…….	Special Notices
5…….	Technical Specifications
6…….	Construction Drawings:
6A……..	Schedule on Construction Drawings
6B……..	Notes on Construction Drawings
6C……..	Large Scale Details on Construction Drawings
6D……..	Small Scale Details on Construction Drawings
7…….	General Requirements
8…….	Special Clauses
9…….	Information for Bidders and General Clauses

53. RECORD DRAWINGS

A. The Owner shall furnish, at the first job meeting, one set of "paper" copies of the contract drawing(s) - this is in addition to the five sets of contract drawings as described in the Article "Contract Drawings" of the General Requirements; for the Contractor's use to indicate change(s) as they occur for the duration of the construction work. Upon request from the Contractor, the County will supply the Contractor a copy of the original Contract Drawings in AutoCAD format.

B. The Contractor shall record neatly and legibly, using reasonable drafting care, all approved change(s) (including minor revisions or corrections of pipes, ducts, electric outlets, circuit panels and other features, as well as invert elevations and locations of underground lines).

C. When all approved changes are recorded and clearly identified, the Contractor shall prepare a set of "as-built" (record) drawings, in the latest version of AutoCAD, using the approved County format and associated CAD layering guidelines, with 24" x 36" drawing sizes, showing the project as built including all changes in the work made during construction based on marked-up prints, drawings, and other data. These drawings shall be filed on a CD and submitted to the Construction Administrator.

D. All additional "paper" or reproducible drawings are to be obtained by the Contractor at their own expense.

54. TIME

A. All time limits (see Article "Required Time For Completion Of The Work" of the General Requirements, and, Article "Time Of Starting" of the Information For Bidders) stated in the specifications are of the essence of the Contract.

B. The Contractor may perform all necessary labor during other than normal working hours. The Owner imposes no limitation of the Contractor's working hours and whatever overtime work may be necessary or required shall be considered by the Contractor and reflected in its Bid Proposal without the benefit or extra compensation. The Contractor must give a minimum of four (4) hours notice to the Construction Administrator when overtime Work is necessary. The Contractor shall promptly pay to the County the additional cost of the Engineer and Construction Administrator for inspection services during the overtime Work.

55. ACCELERATION OF THE WORK

The Owner may, at its sole discretion and for any reason, require the Contractor to accelerate the schedule of performance by providing overtime, extended day, extra crews, Saturday, Sunday and/or holiday work and/or by having all or any subcontractors designated by the Owner provide overtime, extended day, extra crews, Saturday, Sunday or holiday work by the Contractor's or his subcontractor's own forces, and such requirements is independent of and not related in any way to any apparent inability of the Contractor to comply with the schedule(s), Milestone(s) and/or completion date requirements, the Owner, pursuant to a written change order as signed by the Commissioner shall reimburse the Contractor for the direct cost to the Contractor of the premium time for the labor utilized by the Contractor in such overtime, extended day, extra crews, Saturday, Sunday or holiday work(but not for the straight time costs of such labor) together with any social security and state or federal unemployment insurance taxes in connection with such premium time. However, no overhead, supervision costs, commissions, profit or other costs and expenses of any nature whatsoever, including impact costs or costs associated with lost efficiency or productivity, shall be payable in connection therewith. Anything to the foregoing notwithstanding, in the event that the Contractor has fallen behind schedule or in the Owner's judgment appears likely to fall behind schedule, Owner shall have the absolute right to direct the Contractor to accelerate the performance of its work, including that of its subcontractors, and the full costs for such acceleration shall be borne solely by the Contractor.

56. ULTRA LOW SULFUR DIESEL FUEL

A. Contractors and Subcontractors operating onroad and nonroad vehicles to perform County work must power those vehicles with ultra low sulfur diesel fuel. Ultra low sulfur diesel fuel is any diesel fuel that has a sulfur content of no more than fifteen parts per million.

B. In addition, all onroad and nonroad diesel vehicles used to perform County work and equipped with a model year 2003 or older engine shall utilize the best available

technology[2] in accordance with the following schedule:

a) effective September 1, 2007 - 35% of all such motor vehicles used on this project;
b) effective September 1, 2008 - 65% of all such motor vehicles used on this project;
c) effective September 1, 2009 - 100% of all such motor vehicles used on this project.

C. All onroad and nonroad diesel vehicles to perform County work having a gross vehicle weight rating of more than 14,000 pounds shall utilize the best available technology or be equipped with an engine certified to the applicable 2007 United States Environmental Protection Agency ("EPA") standard for particulate matter as set forth in Section 86.007-11 of Title 40 of the Code of Federal Regulations or to any subsequent EPA standard for such pollutant that is at least as stringent, in accordance with the following schedule:

a) by September 1, 2007 - 35% of all such motor vehicles;
b) by September 1, 2008 - 65% of all such motor vehicles;
c) by September 1, 2009 - 100% of all such motor vehicles

D. Any contractor who violates any provision of Section 873.1329 shall be liable for a civil penalty not to exceed ten thousand dollars plus twice the amount of money saved by such contractor for failure to comply with this section.

E. Any contractor who makes a false claim may be liable for a civil penalty not to exceed twenty thousand dollars, in addition to twice the amount of money saved by such contractor as a result of having made such false claim.

F. Nothing in this section shall be construed to limit the County's authority to cancel or terminate a contract, deny or withdraw approval to perform a subcontract or provide supplies, issue a non-responsibility finding, issue a non-responsiveness finding, deny a person or entity pre-qualification as a vendor, or otherwise deny a person or entity public entity business.

G. If sufficient quantities of ultra low sulfur diesel fuel are not available to meet the needs of a contractor to fulfill the requirements of this contract, the Contractor may submit a written request to the Commissioner to use diesel fuel with a sulfur content of no more than thirty parts per million as long as the contractor shall use whatever quantity of ultra low sulfur diesel fuel that is available. Such determination shall be made in writing on a case by case basis upon written application to the Commissioner. If the Commissioner grants such authority it shall expire sixty days thereafter and may be renewed upon written request for additional periods of sixty days.

[2] Best Available Technology means a system for reducing the emission of pollutants which is based on technology verified by the U.S. Environmental protection Agency or the California Air Resources Board or which has been identified pursuant to NYC's Department of Environmental Protection that (1) reduces diesel particulate matter emissions by at least 85 percent, as compared to a similar engine operating on traditional diesel fuel without emission control technology, or reduces engine emissions to 0.01 grams diesel particulate matter per brake horsepower per hour or less; and 2) achieves the greatest reduction in emissions of nitrogen oxides at a reasonable cost and in no case produces a net increase in nitrogen oxides in excess of 10%.

H. The Contractor, in order to comply with Subsections B & C above, must retrofit its vehicles to include both of the following in order to comply with the Best Available Technology Requirements:

- Diesel Oxidation Catalysts (DOC)
- Crankcase Vent Filters (CVF)

If the Contractor wants to propose an alternative technology it must submit a written request to the Commissioner with sufficient detail to enable the Commissioner to make a determination as to whether to accept the alternative technology. Any approval of alternative technology must be in writing.

57. QUALIFIED TRANSPORTATION FRINGE PROGRAM

EXECUTIVE ORDER NO. 7-2005

Requires that contractors, concessionaires and vendors doing business with the County enroll in a Qualified Transportation Fringe Program as defined in §132(f)(1) of the IRS Tax Code for all contracts for goods or services of $100,000 or more in any twelve month period during the contract term if such contractor, concessionaire or vendor employs more than 25 individuals who utilize public transportation and/or pay for commuter parking at least 1 day per week regardless of whether those employees are engaged in work pursuant to the contract.

Bidders shall submit the signed statement on Proposal Page 34. Notwithstanding the above, a Bidder may submit a Waiver Application on Proposal Page 35 to the Commissioner.

58. USE OF FLUORESCENT LIGHT BULBS & ENERGY EFFICIENT BULBS

The use of incandescent light bulbs is prohibited in County-owned buildings and facilities. Only fluorescent light bulbs may be installed in County buildings and facilities. Exterior lights must utilize energy-efficient bulbs. For further details see Article 58 of the General Clauses.

59. COUNTY OF WESTCHESTER PHOSPHORUS-FREE LAWN FERTILIZER POLICY

Executive Order 8-2007 limits the use of lawn fertilizers containing phosphorous and other compounds containing phosphorous, such as phosphate on County owned property.

EXECUTIVE ORDER NO.8 OF 2007

WHEREAS, the New York City water supply watershed is a critical drinking water source for approximately eight million New York City consumers and approximately one million upstate consumers. Over eighty-five percent (85%) of Westchester County's residents consume water from the New York City water supply system; and

WHEREAS, eutrophication is a natural aging process of lakes or streams brought on by

nutrient enrichment. Eutrophication can be greatly accelerated by human activities that increase the rate at which nutrients and organic substances enter aquatic ecosystems from their surrounding watersheds; and

WHEREAS, as a result of accelerated eutrophication, enhanced plant growth reduces dissolved oxygen in the water creating severely impaired water bodies with unpleasant water taste and odor, discoloration, release of toxins and increased turbidity that interferes with the health and diversity of indigenous fish, plant, and animal populations and with the recreational use of rivers, lakes and wetlands. Consequently, eutrophication restricts water use for fisheries, recreation, industry, and drinking due to the increased growth of undesirable algae and aquatic weeds and the oxygen shortages caused by their death and decomposition; and

WHEREAS, nutrient pollution due to human activities is one of the leading causes of eutrophication in the NYC Watershed, and is specifically accelerated by the introduction of excessive phosphorus into the environment. In fact, most reservoirs in the East of Hudson portion of the New York City Watershed (5 of the 7 located in Westchester County) are designated as phosphorous-restricted basins in accordance with the New York City Watershed Rules & Regulations due to excessive phosphorous volumes which have not been reduced despite phosphorous reductions mandated by the New York State Department of Environmental Conservation (NYSDEC); and

WHEREAS, one unnecessary source of phosphorus pollution in the watershed is the many pounds oflawn fertilizer applied by residents and businesses in the County of Westchester each year; and

WHEREAS, when phosphorus fertilizer is applied to phosphorus-rich lawns, much of the excess simply runs off of the lawn into the storm drainage systems where it can be carried into rivers, lakes, streams, and wetlands, causing eutrophication; and

WHEREAS, soil tests conducted pursuant to a six-year study by the Cornell Cooperative Extension, an extension of the State's designated Land-Grant University, have shown that approximately 90% of the lawns in Westchester County have medium-to-high levels of phosphorus; and

WHEREAS, the New York City Watershed Pesticide and Fertilizer Technical Working Group, established by the New York City Watershed Memorandum of Agreement, issued a report in 2000, noting the high percentage of phosphorus in regional soils and recommending that phosphorus-based lawn fertilizers be added only when a soil analysis identifies phosphorus deficiencies.

WHEREAS, the proposed Stormwater Phase II regulations recently issued by the New York State Department of Environmental Conservation, and which are expected to go into effect in January of2008, will allow the use of phosphorus-based lawn fertilizers on municipally-owned land only where soil testing indicates that phosphorus concentrations are inadequate, in order to ensure that municipalities in the New York City Watershed are

taking satisfactory steps to achieve the above-referenced mandatory phosphorous reductions.

WHEREAS, the United States Environmental Protection Agency has also determined that a Nonpoint Source Implementation Plan was necessary in the Croton Watershed because the phosphorus reductions necessary to meet the targeted applicable water quality standards could not be achieved by wastewater treatment plant upgrades alone; and

WHEREAS, Section 110.11 of the Laws of Westchester County places the responsibility to supervise, direct and control, subject to law, the administrative services and departments of the county, upon the County Executive; and

WHEREAS, I have determined that restricting the application and use of lawn fertilizer containing phosphorus on all County-owned property will address one source of unnecessary and preventable phosphorus pollution and will improve water quality in the County; and

WHEREAS, the Department of Planning, after review of the applicable regulations under the State Environmental Quality Review Act, has advised that this Executive Order has been classified as a Type II action, pursuant to 6 N.Y.C.R.R. § 617.5(c)(20), "routine or continuing agency administration and management, not including new programs or major reordering of priorities that may affect the environment," and 6 N.Y.C.R.R. § 617.5(c)(27), "adoption o fregulations, policies, procedures and local legislative decisions in connection with any action on this list." As such, no further environmental review is required.

NOW THEREFORE, I, , County Executive of the County of Westchester, in light of the aforementioned, do hereby order and direct each and every department, board, agency, and commission of the County of Westchester under my jurisdiction to ensure that the policies and procedures set forth in the following Phosphorus-Free Lawn Fertilizer Policy are complied with.

COUNTY OF WESTCHESTER
PHOSPHORUS- FREE LAWN FERTILIZER POLICY

I. Definitions:

(1) "Certified laboratory" means any laboratory certified by the New York State Department of Health pursuant to section five hundred two of the New York State Public Health Law to conduct soil analysis.

(2) "Commercial fertilizer" means any substances containing one or more recognized plant nutrients which is used for its plant nutrient content, and which is designed for use or claimed to have value in promoting plant growth, except unmanipulated animal or vegetable manures, agricultural liming material, wood ashes, gypsum and other products exempted by regulation of the New York State Commissioner of Agriculture and Markets.

(3) "Lawn fertilizer" means a commercial fertilizer distributed primarily for non-farm use, such as lawns, shrubbery, flowers, golf courses, municipal parks, cemeteries, greenhouses and nurseries, and such other use as the commissioner may define by regulation. Lawn fertilizer does not include fertilizer products intended primarily for garden and indoor plant application.

II. Use and Application of Lawn Fertilizer:

(1) Any lawn fertilizer that is labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as phosphate, shall not be applied upon any County-owned property, except as provided in section III. Of this Executive Order.

(2) No lawn fertilizer shall be applied upon County-owned property when the ground is frozen.

(3) Lawn fertilizer shall not be applied to any impervious surface upon County-owned property, including parking lots, roadways, and sidewalks. If such application occurs, the fertilizer must be immediately contained and either applied to turf in a manner consistent with this Executive Order or placed in an appropriate container.

III. Exemptions:

The prohibition against the use of lawn fertilizer under section II of this Executive Order shall not apply to:

(1) Newly established turf or lawn areas during their first growing season.

(2) Turf or lawn areas that soil tests, performed within the past three years by a certified laboratory or by the Cornell University Cooperative Extension of Westchester County, confirm the need for additional phosphorus application in accordance with the phosphorus levels established by the Cornell University Cooperative Extension of Westchester County. The lawn fertilizer application shall not contain an amount of phosphorus exceeding the amount and rate of application recommended in the soil test evaluation.

(3) Agricultural uses, vegetable and flower gardens, or application to trees or shrubs.

IV. The transition to phosphorus-free lawn fertilizer shall occur as soon as possible in a manner that avoids wasting of existing inventories; accommodates establishment of supply chains for new products; enables the training of County employees and licensees in appropriate work methods; and allows the phase-out of products and practices inconsistent with this Executive Order. However, in no event shall lawn fertilizer containing phosphorus (i.e., labeled as containing more than 0% phosphorus or other compound containing phosphorus, such as phosphate) be applied upon County-owned property after January 1,2009, unless an exemption set forth in Section III of this Executive Order applies.

V. This Executive Order shall take effect on the date hereof, and shall remain in effect until otherwise superseded, repealed, modified or revoked.

SAMPLE FORMS

DEPARTMENT OF PUBLIC WORKS

Division of Engineering

AFFIRMATIVE ACTION PROGRAM REQUIREMENT- SUBCONTRACTOR(S)

County of Westchester, Department of Public Works

(To Be Completed By Subcontractor and Submitted with Request to Utilize Subcontractor)

Affirmative Action Program

An approved Affirmative Action Plan shall be required for all Subcontractors for public work where the subcontracted work exceeds $50,000 or more than fourteen (14) persons are employed by the Subcontractor.

Does the Subcontractor participate in an approved Affirmative Action Program? Yes [ ] No [ ]

If Yes, give name of Program: _____

_____

If No, how many employees will the Subcontractor employ on this project? _____

An approved Affirmative Action Program shall mean a plan approved or adopted by Westchester County including but not limited to, the Home-Town Plan, the Recruitment Training Program or any other program approved or meeting the requirements of the State or Federal government.

The "Monthly Employment Utilization Report" of the Sample Forms, shall be filled out by the Contractor and/or Subcontractor(s) who are required to have an Affirmative Action Program, prior to the start of the work.

CONTRACTOR'S REPORT OF EMPLOYMENT AND WEEKLY AFFIDAVIT

County of Westchester, Department of Public Works

Contract No._____

Report No._____

Week(s) ending_____

Title of Contract and Location _____

Contractor or Subcontractor _____

Address _____

_____

_____

STATE OF)
COUNTY OF) SS.:

I,_____, being duly sworn, depose and say:

1. I pay or supervise the payment of the persons employed by_____
(Contractor or Subcontractor)
in connection with the above referenced contract;

2. During the payment period commencing on the ____ day of _____,

20____ and ending on the _____ day of _____, 20___, all persons employed by

_____ in connection with such contract have been paid in full
(Contractor or Subcontractor)
weekly wages and supplements earned by such persons except the following: (strikeout, if not applicable)

3. Such persons have been paid the prevailing rate of wages and the supplements as determined and required by Section 220 of the New York State Labor Law.

4. No rebates or deductions have been deducted from such wages and supplements except as authorized or required by applicable statutes or regulations of the Federal, State and County Governments.

5. The following is a true and accurate summary of wages and supplements paid:

_____During the week_____Total to date

Number of names on payroll _____

Hours worked _____

Total wages earned_____

6. I have read the foregoing statement of wages and supplement, know the contents thereof, and the same is true to my own knowledge.

_____

(Signature)

STATE OF NEW YORK)
COUNTY OF WESTCHESTER) ss.:

On this _____ day of _____, 20___, before me personally came _____ to me known, and known to me to be the person who executed the above instrument, and who being duly sworn did say that he executed the same.

Sworn to before me
this _____ day of _____

_____

License No.

_____

Notary Public - State of New York

MONTHLY EMPLOYMENT UTILIZATION REPORT

County of Westchester, Department of Public Works

MONTHLY EMPLOYMENT UTILIZATION REPORT	JOB TITLE:	CONTRACT NO.:
WESTCHESTER COUNTY DEPARTMENT OF PUBLIC WORKS DIVISION OF ENGINEERING	NAME AND LOCATION OF CONTRACTOR:	REPORTING PERIOD: FROM: _____ TO: _____

CONSTRUCTION TRADE	CLASSIFICATION	WORK HOURS OF EMPLOYMENT												MINORITY PERCENTAGE %	FEMALE PERCENTAGE %	TOTAL NUMBER OF EMPLOYEES		TOTAL NUMBER OF MINORITY EMPLOYEES	
		TOTAL ALL EMPLOYEES BY TRADE				BLACK (NOT HISPANIC ORIGNAL)		HISPANIC		ASIAN OR PACIFIC ISLANDERS		AMERICAN INDIAN OR ALASKAN NATIVE							
		M	HRS	F	HRS	M	F	M	F	M	F	M	F			M	F	M	F
	JOURNEY WORKER																		
	APPRENTICE																		
	TRAINEE																		
	SUB-TOTAL																		
	JOURNEY WORKER																		
	APPRENTICE																		
	TRAINEE																		
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	SUB-TOTAL																		
	JOURNEY WORKER																		
	APPRENTICE																		
	TRAINEE																		
	SUB-TOTAL																		
TOTAL JOURNEY WORKER																			
TOTAL APPRENTICES																			
TOTAL TRAINEES																			
GRAND TOTAL (#HRS & #EMPL)																			

COMPANY OFFICAL'S SIGNATURE AND TITLE:	TELEPHONE NUMBER (Include Area Code):	DATE SIGNED:	PAGE: _____ OF _____

This report must be filled out by all contractors (both prime and sub) who are required to have an Affirmative Action Program, and must be filed with the Engineer by the 5th day of each month during the term of the Contract, and shall include the total work hours of each employee classification in each trade in the covered area for the Monthly Reporting Period. The Prime Contractor shall submit a report for its Aggregate Work Force and collect and submit reports for each subcontractor's Aggregate Work Force to the Engineer.

SHOP DRAWING SCHEDULE

County of Westchester, Department of Public Works

SHOP DRAWING SCHEDULE											
SPECIFICATION NUMBER	DESCRIPTION OF ITEM/MODEL #	SUBMISSION	REQUEST FROM CONTRACTOR TO MANUFACTURER	RECEIVED BY CONTRACTOR FROM MANUFACTURER	RECEIVED BY COUNTY FROM CONTRACTOR	RETURNED BY COUNTY TO CONTRACTOR	RETURNED BY CONTRACTOR TO MANUFACTURER	APPROVED BY COUNTY	APPROVED SHOP DRAWINGS TO MANUFACTURER FROM CONTRACTOR	INVOICE NO. AND SCHEDULED DELIVERY DATE	ACTUAL DELIVERY DATE
		ORIGINAL									
		2									
		3									
		4									
		ORIGINAL									
		2									
		3									
		4									
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		3									
		4									
		ORIGINAL									
		2									
		3									
		4									

SHOP DRAWING ID

County of Westchester, Department of Public Works

WESTCHESTER COUNTY DRAWING _____ OF _____

NAME OF PROJECT

_____

Date _____

Contract No. _____

Item/Model No. _____

Manufacturer _____

Contract Drawing No. _____

Specification Section _____

This document has been reviewed, coordinated and checked for accuracy of content and for compliance with the Contract Documents. The information contained herein has been coordinated with all other Contract Work.

Contractor _____

Signed _____

REQUEST FOR APPROVAL OF EQUAL

County of Westchester, Department of Public Works

SPECIFICATION NO.	ITEM	EQUAL

Attach a separate sheet here if more space is required.

REQUEST FOR APPROVAL OF SUBSTITUTIONS

County of Westchester, Department of Public Works

ITEM NO.	ITEM	SUBSTITUTION	COST OF SPECIFIED ITEM	COST OF SUBSTITUTED ITEM	SAVINGS TO COUNTY

Attach a separate sheet here if more space is required.

CONTRACTOR'S ULTRA LOW SULFUR DIESEL FUEL AFFIDAVIT

County of Westchester, Department of Public Works

Contract No. _____Period Included in this Report:_____, 20__ to _____, 20__

Title of Contract and Location_____
_____

Contractor _____
Address_____

Subcontractor _____
Address_____

STATE OF) ss.:
COUNTY OF)

I, _____being duly sworn, depose and say:
(print name) (print title)

1. I certify under penalty of perjury that I agree to comply with the requirements of Chapter 878, Article XIII, Section 873.13.29 of the Laws of Westchester County.
2. During the period _____ through _____, all diesel-powered vehicles, used in the performance of Contract No._____, were powered by ultra low sulfur diesel fuel (15 ppm Sulfur Maximum).
3. No fuel other than Ultra Low Sulfur Diesel Fuel (15 ppm Sulfur Maximum) was utilized on this project for the above described vehicles.
4. The annexed Ultra Low Sulfur Diesel Fuel Log is a true and accurate summary of the low sulfur diesel fuel (15 ppm Sulfur Maximum) purchased and utilized in the performance of this project.
5. I have read the foregoing statement, have full knowledge of the contents thereof, and it is my intent that the County of Westchester will rely on the statements contained herein.

_____
(Signature)

STATE OF) ss.:
COUNTY OF)

On this _____ day of _____, 20__, before me personally came _____ to me known, and known to me to be the person who executed the above instrument, and who being duly sworn did say that he/she executed the same.

Sworn to before me this

_____day of _____, 20__.

_____

Notary Public

The Ultra Low Sulfur Diesel Fuel-Log must be attached.

This Certification also has to be submitted by your subcontractor(s). *Additional copies of this form can be acquired from the Department of Public Work.*

ULTRA LOW SULFUR DIESEL FUEL (15 ppm Sulfur Maximum) – LOG

Period of Log: _____ through _____

Contract No. _____

Title of Contract and Location_____
_____

Contractor or Subcontractor_____
Address_____

Date of Purchase	Name and Address of Vendor (Print)	Gallons Purchased

A Separate Copy of this Certification will also have to be signed by each of your subcontractors that utilize diesel powered vehicles, fifty horsepower or greater, on the above project. *Additional copies of this form can be acquired from the Department of Public Works.*

Westchester gov.com

Westchester County • Department of Finance • Treasury Division

Electronic Funds Transfer (EFT) Vendor Direct Payment Authorization Form

Authorization is: *(check one)*

- ❒ New
- ❒ Change
- ❒ No Change

INSTRUCTIONS: Please complete both sections of this Authorization form and attach a voided check. See the reverse for more information and instructions (Forms Page 21). If you previously submitted this form and there is no change to the information previously submitted, ONLY complete lines 1 through 6 of section 1.

Section I - Vendor Information

1. Vendor Name:

2. Taxpayer ID Number or Social Security Number:

3. Vendor Primary Address

4. Contact Person Name: | Contact Person Telephone Number:

5. Vendor E-Mail Addresses for Remittance Notification:

6. Vendor Certification: *I have read and understand the Vendor Direct Payment Program and hereby authorize payments to be received by electronic funds transfer into the bank that I designate in Section II. I further understand that in the event that an erroneous electronic payment is sent, Westchester County reserves the right to reverse the electronic payment. In the event that a reversal cannot be implemented, Westchester County will utilize any other lawful means to retrieve payments to which the payee was not entitled.*

Authorized Signature | Print Name/Title | Date

Section II- Financial Institution Information

7. Bank Name:

8. Bank Address:

9. Routing Transit Number:

10. Account Type: (check one) ❒ Checking ❒ Savings

11. Bank Account Number: | 12. Bank Account Title:

13. Bank Contact Person Name: | Telephone Number:

14. FINANCIAL INSTITUTION CERTIFICATION (required **ONLY** if directing funds into a Savings Account **OR** if a voided check is not attached to this form): *I certify that the account number and type of account is maintained in the name of the vendor named above. As a representative of the named financial Institution, I certify that this financial Institution is ACH capable and agrees to receive and deposit payments to the account shown.*

Authorized Signature | Print Name / Title | Date

(Leave Blank - to be completed by Westchester County) - Vendor number assigned

Electronic Funds Transfer (EFT)
Vendor Direct Payment Authorization Form

GENERAL INSTRUCTIONS

Please complete both sections of the Vendor Direct Payment Authorization Form and forward the completed form (along with a voided check for the account to which you want your payments credited) to: Westchester County Board of Acquisition and Contract, 148 Martine Ave, Room 104, White Plains, NY 10601, Attention: Vendor Direct. Please see item 14 below regarding attachment of a voided check.

Section I - VENDOR INFORMATION

1. Provide the name of the vendor as it appears on the W-9 form.
2. Enter the vendor's Taxpayer ID number or Social Security Number as it appears on the W-9 form.
3. Enter the vendor's complete primary address (not a P.O. Box).
4. Provide the name and telephone number of the vendor's contact person.
5. Enter the business e-mail address for the remittance notification. THIS IS VERY IMPORTANT. This is the e-mail address that we will use to send you notification and remittance information two days prior to the payment being credited to your bank account. We suggest that you provide a group mailbox (if applicable) for your e-mail address. You may also designate multiple e-mail addresses.
6. Please have an authorized Payee/Company official sign and date the form and include his/her title.

Section II - FINANCIAL INSTITUTION INFORMATION

7. Provide bank's name.
8. Provide the complete address of your bank.
9. Enter your bank's 9 digit routing transit number.
10. Indicate the type of account (check one box only).
11. Enter the vendor's bank account number.
12. Enter the title of the vendor's account.
13. Provide the name and telephone number of your bank contact person.
14. If you are directing your payments to a Savings Account OR you can not attach a voided check for your checking account, this line needs to be completed and signed by an authorized bank official. IF YOU DO ATTACH A VOIDED CHECK FOR A CHECKING ACCOUNT, YOU MAY LEAVE THIS LINE BLANK.

DPW 10/08

SAMPLE CONTRACT AND BOND

FOR CONSTRUCTION

DEPARTMENT OF PUBLIC WORKS

Division of Engineering

WESTCHESTERGOV . COM

DEPARTMENT OF PUBLIC WORKS
OFFICE OF THE COMMISSIONER

CONTRACT AND BOND

FOR CONTRACT

SAMPLE

NOTE: ONLY PROVIDED AS A SAMPLE IN THESE SPECIFICATIONS FOR INFORMATIONAL PURPOSES AND NOT TO BE EXECUTED WHEN SUBMITTING THE BID PROPOSAL. THE SUCCESSFUL BIDDER WILL BE REQUIRED TO EXECUTE THESE DOCUMENTS, AS MORE FULLY DESCRIBED IN THE PROPOSAL REQUIREMENTS.

CONTRACT NO. Amount of Contract $

THIS AGREEMENT made this _____ day of _____, 200__, by and between the COUNTY OF WESTCHESTER, a municipal corporation of the State of New York, hereinafter, "County", and

hereinafter called the "Contractor", WITNESSETH as follows:

WHEREAS, the Commissioner of Public Works, hereinafter called "Commissioner", by virtue of the power and authority in him vested did advertise for proposals and bids for:

Westchester County, New York, to furnish all labor, tools, implements and materials that may be requisite and necessary to the execution and completion of the work according to the plans, specifications, profiles and other drawings relating to such work, as approved by the County of Westchester and now on file in the Office of the Commissioner, and

WHEREAS, the Contractor did bid for said work in the manner and form as required by said plans and specifications and, being the lowest responsible bidder therefore, was duly awarded the Contract for such work at prices named in the itemized proposal by a resolution of the Board of Acquisition and Contract of the said County of Westchester.

NOW THEREFORE, the Contractor, in consideration of the prices so named for the various items of work to be paid for as hereinafter provided, does for itself, its representatives, agents, executors, administrators, successors or assigns, covenant and agree with the County that it, the said Contractor, shall and will at its own proper costs and charges and in conformity with said plans and specifications which are made a part of this Contract without setting forth same herein, provide all manner and kind of materials, molds, models, cartage, appliances and appurtenances required and of every description necessary for the due and proper performance of this Contract and the completion of said work to be done under the supervision and direction of the Commissioner, in a good workmanlike manner and in conformity with said plans and specifications without any alteration, deviation, additions, or omissions therefrom except upon due request and under the written direction of said Commissioner.

The Contractor acknowledges receipt of the "Information for Bidders, General and Special Clauses, Specification, Proposal and Plans" relating to this Contract, as well as all issued Addenda thereto, all of which are expressly incorporated in this Contract as if fully set forth herein.

SAMPLE

IT IS FURTHER UNDERSTOOD AND AGREED by and between the parties to this Contract that if in the opinion of the said Commissioner of the County of Westchester it shall become necessary to make any change in the work called by the plans and specifications which are a part of this Contract, whereby, consistent with the Information for Bidders, the work contemplated by said plans and specifications is modified and reduced and the costs and expenses of such work lessened, that then and in that event the Contractor will do the work as changed and modified and the said Commissioner shall estimate the difference between the original estimate of quantities therefor and the amount that should be paid by reason of the modification and change and the difference shall be deducted from the original estimate of quantities therefore of said Contract and said Contractor shall be paid accordingly. The estimate of said Commissioner shall be final and conclusive upon the parties hereto and may not be challenged except in a proceeding commenced pursuant to Article 78 of the Civil Practice Law and Rules. Any changes, modifications or deductions shall in no way invalidate this Contract and said Contractor agrees that in the event of any such change or modification reducing the original, estimated quantities therefore, it will not make any claim for any profit, or loss of profit by reason thereof. Notwithstanding any dispute or disagreement arising hereunder, Contractor agrees that the Work shall not be delayed nor disrupted by reason thereof.

The County hereby covenants and agrees with the said Contractor, in consideration of the covenants and agreements herein being strictly and in all respects complied with by the said Contractor as specified, that it will well and truly pay unto the said Contractor the unit prices set forth in the Proposal for the various items included in the Contract.

All partial payments will be made in accordance with the provisions set forth in the "Information for Bidders" and especially that part thereof which relates to "Estimates and Payments".

Furthermore, all partial payments will be made on the claim voucher and verified certificate of the Commissioner, both of which shall be filed in the Office of the Commissioner of Finance of the County of Westchester. The said claim voucher shall show the value of the work completed and the verified certificate shall show the said work was done in accordance with the plans and specifications.

With the final estimate the Contractor shall furnish to the Construction Administrator a sworn statement listing all unpaid bills and liabilities incurred under this Contract up to and including the date of the estimate. Where there are any bills or liabilities in excess of moneys due under any estimate under this Contract, the Construction Administrator may withhold payment of the estimate pending a satisfactory proof of settlement or adjustment of any excess claims. No final estimate will be approved or passed for payment unless and until the Contractor furnishes satisfactory proof that all bills and liabilities incurred under the Contract are paid in full and complies with the requirements of Section 220-a of the Labor Law.

Acceptance shall be effected as follows: whenever, in the opinion of the Commissioner, the Contractor shall have completely performed the Contract on his part to be performed, the Commissioner shall so certify in writing to the Board of Acquisition and Contract of the County and file such certificate with the said Board, stating therein, in substance that the work has been duly examined by him and that the same has been fully performed and completed in accordance

SAMPLE

with the terms of the Contract therefor, and recommending the acceptance thereof. When the Board of Acquisition and Contract by resolution duly adopts, approves and ratifies, the said acceptance shall be complete. No final payment shall be made under this Contract until such certificate of completion and recommendation of acceptance have been approved and ratified by a resolution of said Board of Acquisition and Contract.

Unless otherwise provided for in the contract documents, the Commissioner may take over, use, occupy or operate any part of the Work at any time prior to Final Acceptance upon written notification to the Contractor. The Engineer shall inspect the part of the Work to be taken over, used, occupied or operated, and will furnish the Contractor with a written statement of the Work, if any, that remains to be performed on such part. The Contractor shall not object to, nor interfere with, the Commissioner's decision to exercise the rights granted herein. In the event the Commissioner takes over, uses, occupies or operates any part of the work: (i) the Commissioner shall issue a written determination of Substantial Completion with respect to such part of the Work; and (ii) the Contractor shall be relieved of its absolute obligation to protect such part of the unfinished work in accordance with Article 20 of the General Clauses.

The Commissioner will approve a final estimate for final payment consistent with the authorization of final acceptance from the Board of Acquisition and Contract less previous payments and any and all deductions authorized to be made by the Commissioner under the Contract or law. Payment pursuant to such final estimate less any additional deductions authorized to be made by the Commissioner of Finance under the Contract or law shall constitute the final payment and shall be made by the Commissioner of Finance. If the contract is terminated prior to final acceptance the Commissioner is authorized to prepare a final payment as otherwise authorized by the Board of Acquisition and Contract subject to the above noted adjustments.

Upon the completion and acceptance of this Contract by the Board of Acquisition and Contract, as aforesaid, the Commissioner shall proceed with all reasonable diligence to ascertain from actual measurements the whole amount of work done by the Contractor, and also the value of such work under and according to the terms of this Contract, and thereupon make out in writing a final estimate therefor.

After the completion and acceptance as herein above-mentioned, the Commissioner of Public Works shall file with the Commissioner of Finance of the County of Westchester the original verified certificate, claim voucher and the certification required by Section 220-a of the Labor Law, together with a certified copy of the resolution of approval and ratification of the Board of Acquisition and Contract of the said verified certificate and claim voucher and the resolution of acceptance of completion.

IT IS FURTHER UNDERSTOOD AND AGREED by and between the parties to this Contract that the Contractor will accept the unit prices named in the proposal for all additions to or deductions from the original quantities as given in the specifications. It is agreed that the Commissioner will make estimates of the value for the work completed as provided in the specifications and the final estimate will be made accordingly.

SAMPLE

The Contractor further agrees that if at any time before or within thirty days after the whole of the work herein agreed to be performed has been completed and accepted any person or persons claiming to have performed any labor or furnished any material towards the performance and completion of this contract shall file with the proper officials any such notice as is described in the Lien Law, or any other act of the Legislature of the State of New York, the Contractor shall cause such Lien to be discharged of record. Otherwise and in every case and until the Lien is discharge of record the County shall retain, anything herein to the contrary notwithstanding, from the moneys under its control and due or to grow due under this Contract the sum of one hundred fifty (150%) percent of the amount of such Lien, unless otherwise authorized to withhold a larger amount. The Contractor further agrees to pay the County upon demand the costs, including but not limited to attorney's fees, incurred by the County in any action(s) brought to foreclose or otherwise enforce said Lien.

The Contractor covenants and agrees to commence the work embraced in this Contract within Ten [10] calendar days after service upon him, by the Commissioner, of written notice instructing him to begin the work and shall complete the same in all respects within _____ consecutive calendar days computed from the date of such Notice to Commence.

It is further understood and agreed by the parties hereto that the time of completion is of the essence of this Contract.

It is further understood and agreed by the Contractor that before entering upon the performance of this Contract it shall have approved by the County Attorney the Bond required to be furnished by it in the sum of----------
[$] conditioned for the faithful performance of the work.

The Contractor hereby covenants and agrees to observe the plans, specifications and directions of the Commissioner in the doing of the work provided for under this Contract and to furnish the necessary materials and implements required therefore and to remove condemned material and rubbish as provided by plans and specifications and to employ a competent and sufficient force of workmen to complete the work of this improvement within the time specified. Should the Contractor at any time become insolvent, make an assignment for the benefit of creditors, abandon the Work, reduce its working force to a number which, if maintained, would be insufficient, in the sole opinion of the Commissioner, to complete the Work in accordance with the approved progress schedule; sublet, assign or otherwise dispose of this Contract other than as permitted elsewhere herein, refuse or neglect to supply a sufficiency of properly skilled workmen, or of material of the proper quantity or fail in any respect to prosecute the work with promptness and diligence, or fail in any other way in the performance of any of the agreements herein contained; all the foregoing being deemed acts of default, and such default being certified by the Commissioner, the County of Westchester, acting by the Board of Acquisition and Contract, shall be at liberty after five days written notice to the Contractor to provide any such labor or materials, use any and all sums due or to become due to the Contractor under this Contract, to pay for such labor and material, and if the Commissioner shall certify that such default is sufficient ground for such action, the County of Westchester acting by the Board of Acquisition and Contract, shall also be at liberty to terminate the employment of the Contractor for the said work and to enter upon the premises and take possession for the purpose of completing the work included under this Contract of all materials, tools and appliances thereon

SAMPLE

and to employ any other person or persons to finish the work and provide the materials therefore. Upon the Contractor's receipt of a notice from the County the Contractor shall immediately discontinue all further operations under this Contract. In case of such termination, the Contractor shall not be entitled to receive any further payment under this Contract until the said work shall be wholly finished, at which time if the unpaid balance of the amount to be paid under this Contract shall exceed the reasonable value of the work performed and the material furnished or the total costs therefor, whichever is greater, in finishing the work, such excess shall be paid by the County of Westchester to the Contractor, but if such expense shall exceed such unpaid balance, the Contractor shall pay the difference to the County.

The expense incurred by the County and the total costs as herein provided either for furnishing materials or for finishing the work and any damage incurred through such default shall be certified by the Commissioner whose certificate thereof shall be final and conclusive upon the parties and may not be challenged except in a proceeding commenced pursuant to Article 78 of the Civil Practice Law and Rules.

In case the County shall declare the Contractor in default as to a part of the work only, the Contractor shall immediately discontinue such part, shall continue performing the remainder of the Work in strict conformity with the terms of the Contract.

In completing the whole or any part of the Work under the provisions of this Contract, the Commissioner shall have the power to depart from or change or vary the terms and provisions of this Contract. Such departure, change or variation, even to the extent of accepting a lesser or different performance, shall not affect the conclusiveness of the Commissioner's certification of the cost of completion referred to above, nor shall it constitute a defense to an action to recover the amount by which such certificate exceeds the amount which would have been payable to the Contractor hereunder but for his default or partial default.

In addition to termination as provided for above, the County may terminate this Contract for the convenience of the County by written notice to the Contractor from the Commissioner. In such event and upon receipt of such notice the Contractor shall stop work on the date specified in the notice; take such actions as may be necessary to protect and preserve the County's materials and property; cancel all cancelable orders for material and equipment; assign to the County and deliver to the jobsite or any other location designated by the Commissioner any non-cancelable orders for material and equipment that is not capable of use except in the performance of this Contract and which has been specifically fabricated for the sole purpose of this Contract and not incorporated in the Work; and take no action that will increase the amounts payable by the County under this Contract.

In the event the contract is cancelled for the convenience of the County the following provisions shall apply:

(a) For Work completed prior to the notice of termination, the Contractor shall be paid the fair and reasonable value of its work determined by the pro rata portion of the lump sum bid amount based upon the percent completion of the Work as of the date of termination as determined by the Commissioner, plus work completed pursuant to approved change orders, less amounts

SAMPLE

previously paid. For purposes of determining the pro rata portion of the lump sum bid amount to which the Contractor is entitled, the Contractor's approved bid breakdown pursuant to Article 21 of the Information for Bidders shall be considered but shall not be dispositive as to the fair and reasonable value.

(b) For non-cancelable material and equipment that is not capable of use except in the performance of this Contract and which has been specifically fabricated for the sole purpose of this Contract, but not yet incorporated in the Work, the Contractor shall be paid the fair and reasonable value thereof as determined by the Commissioner, but not more than the Contractor's cost for such material and equipment, plus an additional sum of two (2%) percent of such fair and reasonable value.

(c) In the event the County terminates a lump sum Contract for convenience within thirty (30) days after the Contractor has received the Notice of Award from the County, the Contractor shall be paid one (1%) percent of the difference between the total lump sum bid amount and the total of all payments made prior to the notice of termination plus all payments allowed pursuant to (a) and (b).

(d) On all unit price Contracts, or on unit price items in a Contract, the County will pay the Contractor the sum of (e) and (f) below, less all payments previously made pursuant to this Contract:

(e) For all completed units, the unit price stated in the Contract, and

(f) For units that have been ordered but are only partially completed, the Contractor will be paid (i) a pro rata portion of the unit price as stated in the Contract based upon the percent completion of the unit as determined by the Commissioner and (ii) for non-cancelable material and equipment, payment will be made pursuant to (b), above.

(g) The Commissioner's determination(s) hereunder shall be final, binding and conclusive and subject to review only pursuant to Article 78 of the New York Civil Practice Law and Rules.

(h) The County shall not be liable to the Contractor for any payment or claim if the termination for convenience results in a reduction of thirty (30%) percent or less of the original contract price as bid.

On all Contracts or items in a Contract where time and material records are specified as the basis for payment of the Work, the Contractor shall be paid in accordance with Article 29 of the General Clauses, less all payments previously made pursuant to this Contract.

In no event shall any payments made pursuant to a termination for convenience exceed the Contract price for such items, either individually or collectively.

SAMPLE

All payments made pursuant to a termination for convenience shall be in the nature of liquidated damages and shall be accepted by the Contractor in full satisfaction of all claims against the County.

The County may deduct or set off against any sums due and payable arising from a termination for convenience, any claims it may have against the Contractor.

In the event the County terminates the Contractor for default and it is subsequently determined that the Contractor was not in default, said termination shall automatically be converted for all purposes into a termination for convenience.

It is further understood and agreed between the parties hereto that no certificate given or payment made under this Contract, except the final certificate or final payment shall be conclusive evidence of the performance of this Contract either wholly or in part and that no payment shall be construed to be an acceptance of defective work or improper materials. If the Contractor shall fail to replace any defective work or materials, the County may cause such defective materials to be removed and defective work to be replaced and the expense thereof shall be deducted from the amount to be paid the Contractor.

Anything to the contrary in the preceding paragraph notwithstanding, the Contractor is responsible for the repair of defects in materials and workmanship for a period of one year from the date of final acceptance of the work by the Board of Acquisition and Contract, unless a longer term is specified in the specifications.

The Contractor further agrees not to assign, transfer, convey, sublet or otherwise dispose of this Contract, or its right, title or interest in or to the same, or any part hereof without the previous consent in writing of the Board of Acquisition and Contract of the County. Before a Subcontractor shall proceed with any work, the Commissioner must first recommend and the Board of Acquisition and Contract must approve the use of the Subcontractor on this Contract. If a Subcontractor is not approved it may not work on this Contract. The Contractor specifically waives any claim due to the failure or refusal of the Commissioner or the Board of Acquisition and Contract to approve said Subcontractor.

The Contractor agrees to hold himself responsible for any claims made against the County for any infringement of patents by the use of patented articles in the construction and completion of the work or any process connected with the work agreed to be performed under this Contract or of any material used upon the said work, and shall indemnify and save harmless the County for the costs, expenses and damages which the County may be obligated to pay by reason of any infringement of patents used in the construction and completion of the work.

The parties hereto agree that no laborer, workman or mechanic in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the Contract shall be permitted or required to work more than eight hours in any one calendar day or more than five days in any one week except in cases of extraordinary emergency including fire, flood or danger to life or property. No such person shall be so employed more than eight hours in any day or more than five days in any one week except in such emergency. Time lost in any week because of inclement weather by employees engaged in

SAMPLE

the construction, reconstruction and maintenance of highways outside of the limits of cities and villages may be made up during that week and/or the succeeding three weeks.

The Contractor further agrees to erect and maintain during construction all necessary guards, rails and signals to prevent accidents to persons, vehicles or to the adjoining property and also agrees to use all necessary precautions in blasting and that he will indemnify and save the County of Westchester harmless from all suits and actions of any kind and nature whatsoever from or on account of the construction of said work.

It is further understood and agreed by the parties hereto that should any dispute arise respecting the true construction, interpretation or meaning of the Contract plans, specifications or conditions herein, or the measurements for the payment thereunder, same shall be referred to and decided by the said Commissioner and his decision thereon shall be final and conclusive upon the parties thereto and may not be challenged except in a proceeding commenced pursuant to Article 78 of the Civil Practice Law and Rules. This provision shall also apply to the true value of and duly authorized extra work or any work permitted by agreement in case any work shall be ordered performed, or any work called for shall be so omitted under and upon the direction of said Commissioner.

The Contractor by the submitting of bids and execution of this Contract hereby covenants and agrees that he has examined the plans, specifications and the site work, as to local conditions, difficulties and accuracy of approximate estimate of quantities and does hereby further covenant and agree that he will not make any claim for damages by reason of any such local conditions, difficulties or variation of approximate estimate of quantities.

The Contractor represents and warrants to the County with the knowledge and expectation that this warranty will be relied upon by the County that it is not now participating and has not at any time participated, either directly or through any substantially owned or affiliated person, firm, partnership or corporation, in an international boycott in violation of the provisions of United States Export Administration Act of 1969, 50 USC 2401 et seq. or the regulations promulgated thereunder.

The Contractor further warrants and represents that it is financially solvent, and sufficiently experienced and competent to perform the work and that the facts provided by it to the County in its bid and supporting documents, and contract documents are true and correct in all respects.

This Contract shall become void and any rights of the Contractor hereunder shall be forfeited if, subsequent to the execution hereof, the Contractor is convicted of a violation of the provision of the United States Export Administration Act of 1969, 50 USC 2401 et seq. as amended or has been found upon the final determination of the United States Commerce Department or any other appropriate agency of the United States or the State of New York to have violated such act or regulations.

If the Contractor, any officer, director, or any party holding a controlling interest (defined as five (5%) percent or more, or in the case of a corporation, any stockholder owning five (5%) percent or more of the outstanding shares) is convicted of a crime (excluding Class B and

SAMPLE

Unclassified Misdemeanors as defined under the New York State Penal Law and their equivalent in any city, state or under Federal law related to the type of services or activities which are the subject matter of this Contract) or if a related or affiliated company, partnership or corporation is convicted of a crime (excluding Class B and Unclassified Misdemeanors as defined above) after this Contract is fully executed, the County shall have the right to terminate this Agreement immediately and without penalty. An "affiliated company" as used herein means any affiliate which is a partnership, corporation, proprietorship, association or other entity (i) in which a 50% or greater ownership interest (as defined below) is directly or indirectly held by the Contractor or any of its management personnel (as defined below) or directors, (ii) which directly or indirectly holds 50% or more of the ownership interest in the Contractor, (iii) in which an aggregate 20% or greater ownership interest is directly or indirectly held by one or more shareholders (or partners or proprietors, in the case of a partnership or proprietorship) which or who in the aggregate hold a 20% or greater ownership interest in the Contractor, or (iv) which, whether by Contract or otherwise, directly or indirectly controls, is controlled by or is under common control with the Contractor. An "ownership interest" means the ownership, whether legally or beneficially, of the stock of or assets employed by a corporation, of a partnership interest in or assets employed by a partnership or of a similar interest in or assets employed by any other entity. "Management personnel" means executive officers and all other persons, whether or not officers or employees, who perform policy-making functions similar to those of executive officers.

The Contractor represents that at the time of execution of this Contract, no individual or entity, as described above, has been convicted of a crime during the five (5) year period preceding the execution of this Contract.

The parties hereto recognize that it is the goal of Westchester County to use its best efforts to encourage, promote and increase participation of business enterprises owned and controlled by persons of color or women (MBE/WBE) in contracts or projects funded by all Departments of the County and to effectively and efficiently monitor such participation. Therefore, the Contractor agrees to complete the MBE/WBE Questionnaire, which is attached hereto as Schedule “A,” in furtherance of this goal and in accordance with Local Law No. 27-1997.

It is recognized and understood by the parties that this Contract is subject to appropriation by the Westchester County Board of Legislators. The County shall have no liability under this Contract beyond the funds, if any, that are appropriated and available for payment of the amounts due under this Contract. Notwithstanding the foregoing, the County will do all things lawfully within its power to obtain, maintain and properly request and pursue funds from which payments under this Contract may be made.

The parties hereto for themselves, their legal representatives, successors and assigns, expressly agree that any legal action or proceeding that may arise out of or relating to this Contract shall be brought and maintained only in the courts of the State of New York (“New York State Court”) located in the County of Westchester. With respect to any action between the County and Contractor in New York State Court, the Contractor hereby expressly waives and relinquishes any rights it may otherwise have (i) to move to dismiss on grounds of forum *non*

SAMPLE

conveniens; (ii) to remove to Federal Court; and (iii) to move for a change of venue to a New York State Court outside of Westchester County.

This Contract and its terms, covenants, obligations, conditions and provisions shall be binding upon all the parties hereto, their legal representatives, successors and assigns.

SAMPLE

This Contract shall not be enforceable until it is signed by all parties and approved by the Office of the County Attorney.

IN WITNESS WHEREOF, the parties hereto have executed this agreement, THE COUNTY OF WESTCHESTER pursuant to law by:

_____ its **Commissioner**

and the CONTRACTOR:

By:_____ its _____
(*Type or Print Name*) (*Title*)

THE COUNTY OF WESTCHESTER:

By:_____
Commissioner

CONTRACTOR:

By:_____
(*Signature*)

ATTEST: *(SEAL)*

By:_____
(*Signature*)

Recommended:

_____
Deputy Commissioner of Public Works

Approved as to form and manner of execution
this _____ day of _____, 200__

_____
County Attorney

SAMPLE

CONTRACTOR'S ACKNOWLEDGMENT
(If Corporation)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 200__, before me personally came _____ to me known, and known to me to be the _____ of _____, the Corporation described in and which executed the within instrument, who being by me duly sworn did depose and say that the said _____ resides at _____ and that he/she is the _____ of said Corporation and that he/she signed his/her name thereto by order of the Board of Directors of said Corporation and, if operating under any trade name, that the certificate required by the New York State General Business Law Section 130 has been filed with the Secretary of State of the State of New York.

_____
Notary Public

CONTRACTOR'S ACKNOWLEDGMENT
(If Individual)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 200__, before me personally came _____ to me known, and known to me to be the same person described in and who executed the within instrument and duly acknowledged to me that he/she executed the same for the purpose herein mentioned and, if operating under any trade name, that the certificate required by the New York State General Business Law Section 130 has been filed with the County Clerk of Westchester County.

_____
Notary Public

CONTRACTOR'S ACKNOWLEDGMENT
(If Co-Partnership)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 200__, before me personally came _____ to me known, and known to me to be a member of the firm of _____ and the person described in, and who executed the within instrument in behalf of said firm, and he/she acknowledged to me that he/she executed the same in behalf of, and as the act of said firm for the purposes herein mentioned and, if operating under any trade name, that the certificate required by the New York State General Business Law Section 130 has been filed with the County Clerk of Westchester County.

_____
Notary Public

SAMPLE

CERTIFICATE OF AUTHORITY

I, _____
(*Officer other than officer signing contract*)

certify that I am _____ of
(*Title*)

the _____
(*Name of Corporation*)

organized and in good standing under the _____
(*Law under which organized*)

named in the foregoing agreement; that _____
(*Person executing agreement*)

who signed said agreement on behalf of the Contractor was, at the time of execution the

_____ of the Corporation; that said agreement was duly
(*Title of such person*)

signed for and on behalf of said Corporation by authority of its Board of Directors, thereunto duly authorized and is in full force and effect at the date hereof.

_____
(*Signature*)

(SEAL)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 200__, before me personally came _____ to me known, and known to me to be the _____ of _____, the Corporation described in and which executed the above certificate, who being by me duly sworn did depose and say that the said _____ resides at _____ and that he/she is _____ of said Corporation and knows the Corporate Seal of the said Corporation; that the seal affixed to the above certificate is such Corporate Seal and was so affixed by order of the Board of Directors of said Corporation, and that he/she signed his/her name thereto by like order.

_____
Notary Public

SAMPLE

CORPORATE ACKNOWLEDGEMENT
(Sole Officer)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 200__, before me personally came

_____ to me known, and known to me to be the
(*Name*)

_____ of _____,
(*Title*) (*Name of Corporation*)

the Corporation described in and which executed the within instrument, who being by me duly sworn did depose and say that he/she signed the within instrument, on behalf of said Corporation, in his/her capacity as _____ and Sole Officer and
(*Title*)

director of said Corporation and that he/she owns all the issued and outstanding capital stock of said Corporation and knows the Corporate Seal of the said Corporation; and, if operating under any trade name, that the certificate required by New York State General Business Law Section 130 has been filed with the Secretary of State of the State of New York.

_____
Notary Public

SAMPLE

PERFORMANCE AND PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that we

(hereinafter called the "Principal"), and the _____

_____

a Corporation created and existing under the laws of the State of _____

and having its principal office at _____
in the City of _____ (hereinafter called the "Surety"), are held and firmly bound unto The County of Westchester (hereinafter called the "Obligee") in the penal sum of----------**DOLLARS**---------**AND**----------**/100**----------**[$]**

lawful money of the United States of America, for the payment of which, well and truly to be made, the said Principal binds itself, (himself, themselves) and its (his, their) successors and assigns, and the said Surety binds itself and its successors and assigns, all jointly and severally, firmly by these presents. Said penal sum shall apply separately and independently, in its total amount, to the payment provision and the performance provision of this Bond shall not reduce or limit the right of the Obligee to recover under the other said provision.

Signed, sealed and dated this _____ day of _____, 200__.

WHEREAS, said Principal has entered into a certain written contract with said Obligee, dated this _____ day of _____, 200__, (hereinafter called the "Contract")

For ----**CONTRACT #** _____a copy of which Contract is hereto annexed and hereby made a part of this bond as if herein set forth in full.

SAMPLE

NOW THEREFORE, THE CONDITIONS OF THE ABOVE OBLIGATIONS ARE SUCH THAT, if the said Principal, and its (his, their) successors or assigns, or any or either of them shall,

(1) well and truly and in good, sufficient and workmanlike manner, perform or cause to be performed such Contract, and any amendment or extension of or addition thereto, and each and every of the covenants, promises, agreements and provisions therein stipulated and contained to be performed by said Principal, and complete the same within the period therein mentioned, and in each and every respect, comply with the conditions therein mentioned to be complied with by said Principal, and fully indemnify and save harmless the Obligee from all costs and damages which it may suffer by reason of failure so to do and fully reimburse and repay the Obligee all outlay and expense which it may incur in making good any such default, and

(2) also pay or cause to be paid the wages and compensation for labor performed and services rendered of all persons engaged in the prosecution of the work provided for therein, whether such persons by agents, servants or employees of the Principal, and of its (his, their) successors or assigns, or any Subcontractor or of any assignee thereof, including all persons so engaged who perform the work of laborers or of mechanics regardless of any contractual relationship between the Principal, or its (his, their) successors or assigns, or any Subcontractor or any designee thereof, and such laborers or mechanics, but not including office employees not regularly stationed at the site of the work, and further, shall pay or cause to be paid all lawful claims of Subcontractors and of materialmen and other third persons out of or in connection with said Contract and the work, labor, services, supplies and material furnished in and about the performance and completion thereof, then these obligations shall be null and void, otherwise they shall remain in full force and effect.

PROVIDED, however, that this bond is subject to the following additional conditions and limitations:

(a) All persons who have performed labor or rendered services, as aforesaid, all Subcontractors, and all persons, firms, corporations, including materialmen and third persons, as aforesaid, furnishing work, labor, services, supplies and material under or in connection with said Contract or in or about the performance and completion thereof, shall have a direct right of action (subject to the prior right of the Obligee under any claim which it may assert against the Principal or its (his, their) successors and assigns, and/or the Surety and its successors and assigns) against the Principal and its (his, their) successors and assigns on this bond, which right of action shall be asserted in proceedings instituted in the State in which such work, labor, services, supplies or material was performed, rendered or furnished or where work, labor, services, supplies or material has been performed, rendered or furnished, as aforesaid, in more than one State, than in any such State. Insofar as permitted by the laws of such State, said right of action shall be asserted in a proceeding instituted in the name of Obligee to the use and benefit of the person, firm or corporation instituting such action and of all other persons, firms and corporations having claims hereunder, and any other person, firm or corporation having a claim hereunder shall have the

SAMPLE

right to be made a party to such proceedings (but not later than twelve months after the performance of said Contract and final settlement thereof) and to have such claim adjudicated in such action and judgment rendered thereon. Prior to the institution of such a proceeding by a person, firm or corporation in the name of the Obligee, as aforesaid, such person, firm of corporation shall furnish the Obligee with a Bond of Indemnity for costs, which Bond shall be in an amount satisfactory to the Obligee.

(b) The Surety or its successors or assigns shall not be liable hereunder for any damages or compensation recoverable under any worker's compensation or employer's liability statute.

(c) In no event shall the Surety or its successors or assigns be liable under either the foregoing clause (1) or the foregoing clause (2) for a greater sum than the penalty of this Bond provided; however, that said penalty is separately applicable, in its total amount to each of the foregoing clauses (1) and (2), or subject to any suit, action or proceeding hereon that is instituted by any person, firm or corporation under the provisions of the above section (a) later than twelve months after the complete performance of said Contract and final settlement thereof.

The Principal, for itself (himself, themselves) and its (his, their) successors and assigns, and the Surety, for itself and its successors and assigns, do hereby expressly waive any objections that might be interposed as to the right of the Obligee to require a Bond containing the foregoing provisions, and they do hereby further expressly waive any defense which they or either of them might interpose to an action brought hereon by any person, firm or corporation, including Subcontractors, materialmen, and third persons, for work, labor, services, supplies or material performed, rendered or furnished as aforesaid, upon the ground that there is no law authorizing the said Obligee to require the foregoing provision to be placed in this Bond.

And Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligations of said Surety and of its successors and assigns and this Bond shall in no way be impaired or affected by an extension of time, modification, omission, addition or change in or to the said Contract or the work to be performed thereunder, or by any payment thereunder, before the time required therein, or by any waiver of any provision thereof, or by an assignment, subletting or other transfer thereof, or of any part thereof, or of any work to be performed, or of any moneys due or to become due thereunder; and the said Surety, for itself and its successors and assigns, does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby stipulates and agrees that any and all things done and omitted to be done by and in relation to (executors, administrators), successors, assigns, Subcontractors, and other transferees, shall have the same effect as to said Surety and its successors and assigns, as though done or omitted to be done by and in relation to said Principal.

And Surety, for value received, hereby stipulates and agrees, if requested to do so by Obligee, to fully perform and complete the work to be performed under the Contract, pursuant to the terms, conditions and covenants thereof, if for any cause, the Principal fails or neglects to so

SAMPLE

fully perform and complete such Work. The Surety further agrees to commence such Work of Completion within twenty-five (25) calendar days after written notice thereof from the Obligee, and to complete such Work within twenty-five (25) calendar days from the expiration of the time allowed the Principal in the Contract for the completion of such Work.

WITNESSETH our hands and seals this _____ day of _____, 200__.

PRINCIPAL:

By:_____
(*Signature*)

(SEAL)

ATTEST:

_____

_____
(*Surety*)

By:_____
(*Signature*)

(SEAL)

ATTEST:

_____

SAMPLE

If the Contractor (Principal) is a partnership, the Bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a Corporation, the Bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the Bond corresponding to the number of counterparts of the Contract.

Each executed Bond should be accompanied by:

(a) appropriate acknowledgments of the respective parties;

(b) appropriate duly certified copy of Power of Attorney or other Certificate of Authority where Bond is executed by agent, officer or other representative of Principal or Surety;

(c) a duly certified extract from By-laws or resolutions of Surety under which Power of Attorney or other Certificate of Authority of its agent, officer or representative was issued, and

(d) duly certified copy of latest published financial statement of assets and liabilities of Surety.

SAMPLE

CONTRACTOR'S ACKNOWLEDGMENT
(If Corporation)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 200__, before me personally came _____ to me known, and known to me to be the _____ of _____, the Corporation described in and which executed the within instrument, who being by me duly sworn did depose and say that the said _____ resides at _____ and that he/she is the _____ of said Corporation and knows the Corporate Seal of the said Corporation; that the seal affixed to the within instrument is such Corporate Seal and that it was so affixed by order of the Board of Directors of said Corporation and that he/she signed his/her name thereto by like order.

_____
Notary Public

CONTRACTOR'S ACKNOWLEDGMENT
(If Individual)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 200__, before me personally came _____ to me known, and known to me to be the same person described in and who executed the within instrument and he/she duly acknowledged to me that he/she executed the same for the purpose herein mentioned.

_____
Notary Public

CONTRACTOR'S ACKNOWLEDGMENT
(If Co-Partnership)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 200__, before me personally came _____ to me known, and known to me to be a member of the firm of _____ and the person described in, and who executed the within instrument in behalf of said firm, and acknowledged to me that he/she executed the same in behalf of, and as the act of said firm for the purposes herein mentioned.

_____
Notary Public

SAMPLE

ACKNOWLEDGMENT BY SURETY COMPANY
(Signed by One Authorized Person)

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this _____ day of _____, 200__, before me personally came

_____ to me known, and known to me to be the
(*Name*)

_____ of _____,
(*Title*) (*Name of Corporation*)

the Corporation described in and which executed the within instrument, who being by me duly sworn did depose and say that he/she resides at _____

_____ and that he/she is the _____ of said Corporation
(*Title*)

and knows the Corporate Seal of the said Corporation; that the seal affixed to the within instrument is such Corporate Seal and so affixed by order of the Board of Directors of said Corporation and that he/she signed his/her name thereto by like order; and that the said Corporation has received from the Superintendent of Insurance of the State of New York a Certificate of Solvency, and of its sufficiency as Surety or Guarantor, pursuant to Section 327 of the Insurance Law of the State of New York as amended, and that such Certificate has not been revoked.

_____
Notary Public

SAMPLE

SCHEDULE OF HOURLY RATES

AND SUPPLEMENTS

DEPARTMENT OF PUBLIC WORKS

Division of Engineering

Kathy Hochul, Governor

Roberta Reardon, Commissioner

Westchester County DPWT

Yolanda Spraggins, Secretary II
148 Martine Ave. RM. 518
White Plains NY 10601

Schedule Year	2024 through 2025
Date Requested	08/12/2024
PRC#	2024010242

Location	Mamaroneck
Project ID#	22-526
Project Type	Rehab or replacement of various equipment and systems required to rehabilitate Weaver Street Pumping Station in Mamaroneck Sanitary Sweer District

PREVAILING WAGE SCHEDULE FOR ARTICLE 8 PUBLIC WORK PROJECT

Attached is the current schedule(s) of the prevailing wage rates and prevailing hourly supplements for the project referenced above. A unique Prevailing Wage Case Number (PRC#) has been assigned to the schedule(s) for your project.

The schedule is effective from July 2024 through June 2025. All updates, corrections, posted on the 1st business day of each month, and future copies of the annual determination are available on the Department's website www.labor.ny.gov. Updated PDF copies of your schedule can be accessed by entering your assigned PRC# at the proper location on the website.

It is the responsibility of the contracting agency or its agent to annex and make part, the attached schedule, to the specifications for this project, when it is advertised for bids and /or to forward said schedules to the successful bidder(s), immediately upon receipt, in order to insure the proper payment of wages.

Please refer to the "General Provisions of Laws Covering Workers on Public Work Contracts" provided with this schedule, for the specific details relating to other responsibilities of the Department of Jurisdiction.

Upon completion or cancellation of this project, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

NOTICE OF COMPLETION / CANCELLATION OF PROJECT

Date Completed: _____ Date Cancelled: _____

Name & Title of Representative: _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12226

General Provisions of Laws Covering Workers on Article 8 Public Work Contracts

Introduction

The Labor Law requires public work contractors and subcontractors to pay laborers, workers, or mechanics employed in the performance of a public work contract not less than the prevailing rate of wage and supplements (fringe benefits) in the locality where the work is performed.

Responsibilities of the Department of Jurisdiction

A Department of Jurisdiction (Contracting Agency) includes a state department, agency, board or commission: a county, city, town or village; a school district, board of education or board of cooperative educational services; a sewer, water, fire, improvement and other district corporation; a public benefit corporation; and a public authority awarding a public work contract.

The Department of Jurisdiction (Contracting Agency) awarding a public work contract MUST obtain a Prevailing Rate Schedule listing the hourly rates of wages and supplements due the workers to be employed on a public work project. This schedule may be obtained by completing and forwarding a "Request for wage and Supplement Information" form (PW 39) to the Bureau of Public Work. The Prevailing Rate Schedule MUST be included in the specifications for the contract to be awarded and is deemed part of the public work contract.

Upon the awarding of the contract, the law requires that the Department of Jurisdiction (Contracting Agency) furnish the following information to the Bureau: the name and address of the contractor, the date the contract was let and the approximate dollar value of the contract. To facilitate compliance with this provision of the Labor Law, a copy of the Department's "Notice of Contract Award" form (PW 16) is provided with the original Prevailing Rate Schedule.

The Department of Jurisdiction (Contracting Agency) is required to notify the Bureau of the completion or cancellation of any public work project. The Department's PW 200 form is provided for that purpose.

Both the PW 16 and PW 200 forms are available for completion online.

Hours

No laborer, worker, or mechanic in the employ of a contractor or subcontractor engaged in the performance of any public work project shall be permitted to work more than eight hours in any day or more than five days in any week, except in cases of extraordinary emergency. The contractor and the Department of Jurisdiction (Contracting Agency) may apply to the Bureau of Public Work for a dispensation permitting workers to work additional hours or days per week on a particular public work project.

Wages and Supplements

The wages and supplements to be paid and/or provided to laborers, workers, and mechanics employed on a public work project shall be not less than those listed in the current Prevailing Rate Schedule for the locality where the work is performed. If a prime contractor on a public work project has not been provided with a Prevailing Rate Schedule, the contractor must notify the Department of Jurisdiction (Contracting Agency) who in turn must request an original Prevailing Rate Schedule form the Bureau of Public Work. Requests may be submitted by: mail to NYSDOL, Bureau of Public Work, State Office Bldg. Campus, Bldg. 12, Rm. 130, Albany, NY 12226; Fax to Bureau of Public Work (518) 485-1870; or electronically at the NYSDOL website www.labor.ny.gov.

Upon receiving the original schedule, the Department of Jurisdiction (Contracting Agency) is REQUIRED to provide complete copies to all prime contractors who in turn MUST, by law, provide copies of all applicable county schedules to each subcontractor and obtain from each subcontractor, an affidavit certifying such schedules were received. If the original schedule expired, the contractor may obtain a copy of the new annual determination from the NYSDOL website www.labor.ny.gov.

The Commissioner of Labor makes an annual determination of the prevailing rates. This determination is in effect from July 1st through June 30th of the following year. The annual determination is available on the NYSDOL website www.labor.ny.gov.

Payrolls and Payroll Records

Every contractor and subcontractor MUST keep original payrolls or transcripts subscribed and affirmed as true under penalty of perjury. As per Article 6 of the Labor law, contractors and subcontractors are required to establish, maintain, and preserve for not less than six (6) years, contemperaneous, true, and accurate payroll records. At a minimum, payrolls must show the following information for each person employed on a public work project: Name, Address, Last 4 Digits of Social Security Number, Classification(s) in which the worker was employed, Hourly wage rate(s) paid, Supplements paid or provided, and Daily and weekly number of hours worked in each classification.

The filing of payrolls to the Department of Jurisdiction is a condition of payment.Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury. The Department of Jurisdiction (Contracting Agency) shall collect, review for facial validity, and maintain such payrolls.

In addition, the Commissioner of Labor may require contractors to furnish, with ten (10) days of a request, payroll records sworn to as their validity and accuracy for public work and private work. Payroll records include, but are not limited to time cards, work description sheets, proof that supplements were provided, cancelled payroll checks and payrolls. Failure to provide the requested information within the allotted ten (10) days will result in the withholding of up to 25% of the contract, not to exceed $100,000.00. If the contractor or subcontractor does not maintain a place of business in New York State and the amount of the contract exceeds $25,000.00, payroll records and certifications must be kept on the project worksite.

The prime contractor is responsible for any underpayments of prevailing wages or supplements by any subcontractor.

All contractors or their subcontractors shall provide to their subcontractors a copy of the Prevailing Rate Schedule specified in the public work contract as well as any subsequently issued schedules. A failure to provide these schedules by a contractor or subcontractor is a violation of Article 8, Section 220-a of the Labor Law.

All subcontractors engaged by a public work project contractor or its subcontractor, upon receipt of the original schedule and any subsequently issued schedules, shall provide to such contractor a verified statement attesting that the subcontractor has received the Prevailing Rate Schedule and will pay or provide the applicable rates of wages and supplements specified therein. (See NYS Labor Laws, Article 8 . Section 220-a).

Determination of Prevailing Wage and Supplement Rate Updates Applicable to All Counties

The wages and supplements contained in the annual determination become effective July 1st whether or not the new determination has been received by a given contractor. Care should be taken to review the rates for obvious errors. Any corrections should be brought to the Department's attention immediately. It is the responsibility of the public work contractor to use the proper rates. If there is a question on the proper classification to be used, please call the district office located nearest the project. Any errors in the annual determination will be corrected and posted to the NYSDOL website on the first business day of each month. Contractors are responsible for paying these updated rates as well, retroactive to July 1st.

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. To the extent possible, the Department posts rates in its possession that cover periods of time beyond the July 1st to June 30th time frame covered by a particular annual determination. Rates that extend beyond that instant time period are informational ONLY and may be updated in future annual determinations that actually cover the then appropriate July 1st to June 30th time period.

Withholding of Payments

When a complaint is filed with the Commissioner of Labor alleging the failure of a contractor or subcontractor to pay or provide the prevailing wages or supplements, or when the Commissioner of Labor believes that unpaid wages or supplements may be due, payments on the public work contract shall be withheld from the prime contractor in a sufficient amount to satisfy the alleged unpaid wages and supplements, including interest and civil penalty, pending a final determination.

When the Bureau of Public Work finds that a contractor or subcontractor on a public work project failed to pay or provide the requisite prevailing wages or supplements, the Bureau is authorized by Sections 220-b and 235.2 of the Labor Law to so notify the financial officer of the Department of Jurisdiction (Contracting Agency) that awarded the public work contract. Such officer MUST then withhold or cause to be withheld from any payment due the prime contractor on account of such contract the amount indicated by the Bureau as sufficient to satisfy the unpaid wages and supplements, including interest and any civil penalty that may be assessed by the Commissioner of Labor. The withholding continues until there is a final determination of the underpayment by the Commissioner of Labor or by the court in the event a legal proceeding is instituted for review of the determination of the Commissioner of Labor.

The Department of Jurisdiction (Contracting Agency) shall comply with this order of the Commissioner of Labor or of the court with respect to the release of the funds so withheld.

Summary of Notice Posting Requirements

The current Prevailing Rate Schedule must be posted in a prominent and accessible place on the site of the public work project. The prevailing wage schedule must be encased in, or constructed of, materials capable of withstanding adverse weather conditions and be titled "PREVAILING RATE OF WAGES" in letters no smaller than two (2) inches by two (2) inches.

The "Public Work Project" notice must be posted at the beginning of the performance of every public work contract, on each job site.

Every employer providing workers. compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers. Compensation Board in a conspicuous place on the jobsite.

Every employer subject to the NYS Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers, notices furnished by the State Division of Human Rights.

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the NYS Department of Labor.

Apprentices

Employees cannot be paid apprentice rates unless they are individually registered in a program registered with the NYS Commissioner of Labor. The allowable ratio of apprentices to journeyworkers in any craft classification can be no greater than the statewide building trade ratios promulgated by the Department of Labor and included with the Prevailing Rate Schedule. An employee listed on a payroll as an apprentice who is not registered as above or is performing work outside the classification of work for which the apprentice is indentured, must be paid the prevailing journeyworker's wage rate for the classification of work the employee is actually performing.

NYSDOL Labor Law, Article 8, Section 220-3, require that only apprentices individually registered with the NYS Department of Labor may be paid apprenticeship rates on a public work project. No other Federal or State Agency of office registers apprentices in New York State.

Persons wishing to verify the apprentice registration of any person must do so in writing by mail, to the NYSDOL Office of Employability Development / Apprenticeship Training, State Office Bldg. Campus, Bldg. 12, Albany, NY 12226 or by Fax to NYSDOL Apprenticeship Training (518) 457-7154. All requests for verification must include the name and social security number of the person for whom the information is requested.

The only conclusive proof of individual apprentice registration is written verification from the NYSDOL Apprenticeship Training Albany Central office. Neither Federal nor State Apprenticeship Training offices outside of Albany can provide conclusive registration information.

It should be noted that the existence of a registered apprenticeship program is not conclusive proof that any person is registered in that program. Furthermore, the existence or possession of wallet cards, identification cards, or copies of state forms is not conclusive proof of the registration of any person as an apprentice.

Interest and Penalties

In the event that an underpayment of wages and/or supplements is found:

- Interest shall be assessed at the rate then in effect as prescribed by the Superintendent of Banks pursuant to section 14-a of the Banking Law, per annum from the date of underpayment to the date restitution is made.
- A Civil Penalty may also be assessed, not to exceed 25% of the total of wages, supplements, and interest due.

Debarment

Any contractor or subcontractor and/or its successor shall be ineligible to submit a bid on or be awarded any public work contract or subcontract with any state, municipal corporation or public body for a period of five (5) years when:

- Two (2) willful determinations have been rendered against that contractor or subcontractor and/or its successor within any consecutive six (6) year period.
- There is any willful determination that involves the falsification of payroll records or the kickback of wages or supplements.

Criminal Sanctions

Willful violations of the Prevailing Wage Law (Article 8 of the Labor Law) may be a felony punishable by fine or imprisonment of up to 15 years, or both.

Discrimination

No employee or applicant for employment may be discriminated against on account of age, race, creed, color, national origin, sex, disability or marital status.

No contractor, subcontractor nor any person acting on its behalf, shall by reason of race, creed, color, disability, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates (NYS Labor Law, Article 8, Section 220-e(a)).

No contractor, subcontractor, nor any person acting on its behalf, shall in any manner, discriminate against or intimidate any employee on account of race, creed, color, disability, sex, or national origin (NYS Labor Law, Article 8, Section 220-e(b)).

The Human Rights Law also prohibits discrimination in employment because of age, marital status, or religion.

There may be deducted from the amount payable to the contractor under the contract a penalty of $50.00 for each calendar day during which such person was discriminated against or intimidated in violation of the provision of the contract (NYS Labor Law, Article 8, Section 220-e(c)).

The contract may be cancelled or terminated by the State or municipality. All monies due or to become due thereunder may be forfeited for a second or any subsequent violation of the terms or conditions of the anti-discrimination sections of the contract (NYS Labor Law, Article 8, Section 220-e(d)).

Every employer subject to the New York State Human Rights Law must conspicuously post at its offices, places of employment, or employment training centers notices furnished by the State Division of Human Rights.

Workers' Compensation

In accordance with Section 142 of the State Finance Law, the contractor shall maintain coverage during the life of the contract for the benefit of such employees as required by the provisions of the New York State Workers' Compensation Law.

A contractor who is awarded a public work contract must provide proof of workers' compensation coverage prior to being allowed to begin work.

The insurance policy must be issued by a company authorized to provide workers' compensation coverage in New York State. Proof of coverage must be on form C-105.2 (Certificate of Workers' Compensation Insurance) and must name this agency as a certificate holder.

If New York State coverage is added to an existing out-of-state policy, it can only be added to a policy from a company authorized to write workers' compensation coverage in this state. The coverage must be listed under item 3A of the information page.

The contractor must maintain proof that subcontractors doing work covered under this contract secured and maintained a workers' compensation policy for all employees working in New York State.

Every employer providing worker's compensation insurance and disability benefits must post notices of such coverage in the format prescribed by the Workers' Compensation Board in a conspicuous place on the jobsite.

Unemployment Insurance

Employers liable for contributions under the Unemployment Insurance Law must conspicuously post on the jobsite notices furnished by the New York State Department of Labor.

Kathy Hochul, Governor

Roberta Reardon, Commissioner

Westchester County DPWT

Yolanda Spraggins, Secretary II
148 Martine Ave. RM. 518
White Plains NY 10601

Schedule Year 2024 through 2025
Date Requested 08/12/2024
PRC# 2024010242

Location Mamaroneck
Project ID# 22-526
Project Type Rehab or replacement of various equipment and systems required to rehabilitate Weaver Street Pumping Station in Mamaroneck Sanitary Sweer District

Notice of Contract Award

New York State Labor Law, Article 8, Section 220.3a requires that certain information regarding the awarding of public work contracts, be furnished to the Commissioner of Labor. One "Notice of Contract Award" (PW 16, which may be photocopied), **MUST** be completed for **EACH** prime contractor on the above referenced project.

Upon notifying the successful bidder(s) of this contract, enter the required information and mail **OR** fax this form to the office shown at the bottom of this notice, **OR** fill out the electronic version via the NYSDOL website.

Contractor Information
All information must be supplied

Federal Employer Identification Number: _____

Name: _____

Address: _____

_____

City: _____ State: _____ Zip: _____

Amount of Contract: $_____

Approximate Starting Date: ____/____/____

Approximate Completion Date: ____/____/____

Contract Type:
[ ] (01) General Construction
[ ] (02) Heating/Ventilation
[ ] (03) Electrical
[ ] (04) Plumbing
[ ] (05) Other : _____

Phone: (518) 457-5589 Fax: (518) 485-1870
W. Averell Harriman State Office Campus, Bldg. 12, Room 130, Albany, NY 12226

Social Security Numbers on Certified Payrolls:

The Department of Labor is cognizant of the concerns of the potential for misuse or inadvertent disclosure of social security numbers. Identity theft is a growing problem and we are sympathetic to contractors' concern regarding inclusion of this information on payrolls if another identifier will suffice.

For these reasons, the substitution of the use of the last four digits of the social security number on certified payrolls submitted to contracting agencies on public work projects is now acceptable to the Department of Labor. This change does not affect the Department's ability to request and receive the entire social security number from employers during its public work/ prevailing wage investigations.

Construction Industry Fair Play Act: Required Posting for Labor Law Article 25-B § 861-d

Construction industry employers must post the "Construction Industry Fair Play Act" notice in a prominent and accessible place on the job site. Failure to post the notice can result in penalties of up to $1,500 for a first offense and up to $5,000 for a second offense. The posting is included as part of this wage schedule. Additional copies may be obtained from the NYS DOL website, https://dol.ny.gov/public-work-and-prevailing-wage
If you have any questions concerning the Fair Play Act, please call the State Labor Department toll-free at 1-866-435-1499 or email us at: dol.misclassified@labor.ny.gov .

Worker Notification: (Labor Law §220, paragraph a of subdivision 3-a)

Effective June 23, 2020

This provision is an addition to the existing wage rate law, Labor Law §220, paragraph a of subdivision 3-a. It requires contractors and subcontractors to provide written notice to all laborers, workers or mechanics of the *prevailing wage and supplement rate* for their particular job classification *on each pay stub**. It also requires contractors and subcontractors to *post a notice* at the beginning of the performance of every public work contract *on each job site* that includes the telephone number and address for the Department of Labor and a statement informing laborers, workers or mechanics of their right to contact the Department of Labor if he/she is not receiving the proper prevailing rate of wages and/or supplements for his/her job classification. The required notification will be provided with each wage schedule, may be downloaded from our website *www.labor.ny.gov* or be made available upon request by contacting the Bureau of Public Work at 518-457-5589. *In the event the required information will not fit on the pay stub, an accompanying sheet or attachment of the information will suffice.

(12.20)

To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

Budget Policy & Reporting Manual

B-610

Public Work Enforcement Fund

effective date December 7, 2005

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1. Purpose and Scope:

This Item describes the Public Work Enforcement Fund (the Fund, PWEF) and its relevance to State agencies and public benefit corporations engaged in construction or reconstruction contracts, maintenance and repair, and announces the recently-enacted increase to the percentage of the dollar value of such contracts that must be deposited into the Fund. This item also describes the roles of the following entities with respect to the Fund:

- New York State Department of Labor (DOL),
- The Office of the State of Comptroller (OSC), and
- State agencies and public benefit corporations.

2. Background and Statutory References:

DOL uses the Fund to enforce the State's Labor Law as it relates to contracts for construction or reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law. State agencies and public benefit corporations participating in such contracts are required to make payments to the Fund.

Chapter 511 of the Laws of 1995 (as amended by Chapter 513 of the Laws of 1997, Chapter 655 of the Laws of 1999, Chapter 376 of the Laws of 2003 and Chapter 407 of the Laws of 2005) established the Fund.

3. Procedures and Agency Responsibilities:

The Fund is supported by transfers and deposits based on the value of contracts for construction and reconstruction, maintenance and repair, as defined in subdivision two of Section 220 of the Labor Law, into which all State agencies and public benefit corporations enter.

Chapter 407 of the Laws of 2005 increased the amount required to be provided to this fund to .10 of one-percent of the total cost of each such contract, to be calculated at the time agencies or public benefit corporations enter into a new contract or if a contract is amended. The provisions of this bill became effective August 2, 2005.

To all State Departments, Agency Heads and Public Benefit Corporations
IMPORTANT NOTICE REGARDING PUBLIC WORK ENFORCEMENT FUND

OSC will report to DOL on all construction-related ("D") contracts approved during the month, including contract amendments, and then DOL will bill agencies the appropriate assessment monthly. An agency may then make a determination if any of the billed contracts are exempt and so note on the bill submitted back to DOL. For any instance where an agency is unsure if a contract is or is not exempt, they can call the Bureau of Public Work at the number noted below for a determination. Payment by check or journal voucher is due to DOL within thirty days from the date of the billing. DOL will verify the amounts and forward them to OSC for processing.

For those contracts which are not approved or administered by the Comptroller, monthly reports and payments for deposit into the Public Work Enforcement Fund must be provided to the Administrative Finance Bureau at the DOL within 30 days of the end of each month or on a payment schedule mutually agreed upon with DOL.

Reports should contain the following information:

- Name and billing address of State agency or public benefit corporation;
- State agency or public benefit corporation contact and phone number;
- Name and address of contractor receiving the award;
- Contract number and effective dates;
- Contract amount and PWEF assessment charge (if contract amount has been amended, reflect increase or decrease to original contract and the adjustment in the PWEF charge); and
- Brief description of the work to be performed under each contract.

Checks and Journal Vouchers, payable to the "New York State Department of Labor" should be sent to:

Department of Labor
Administrative Finance Bureau-PWEF Unit
Building 12, Room 464
State Office Campus
Albany, NY 12226

Any questions regarding billing should be directed to NYSDOL's Administrative Finance Bureau-PWEF Unit at (518) 457-3624 and any questions regarding Public Work Contracts should be directed to the Bureau of Public Work at (518) 457-5589.

NEW YORK STATE OF OPPORTUNITY. Department of Labor

Required Notice under Article 25-B of the Labor Law

Attention All Employees, Contractors and Subcontractors: You are Covered by the Construction Industry Fair Play Act

The law says that you are an employee unless:

- You are free from direction and control in performing your job, **and**
- You perform work that is not part of the usual work done by the business that hired you, **and**
- You have an independently established business.

Your employer cannot consider you to be an independent contractor unless all three of these facts apply to your work.

It is against the law for an employer to misclassify employees as independent contractors or pay employees off the books.

Employee Rights: If you are an employee, you are entitled to state and federal worker protections. These include:

- Unemployment Insurance benefits, if you are unemployed through no fault of your own, able to work, and otherwise qualified,
- Workers' compensation benefits for on-the-job injuries,
- Payment for wages earned, minimum wage, and overtime (under certain conditions),
- Prevailing wages on public work projects,
- The provisions of the National Labor Relations Act, and
- A safe work environment.

It is a violation of this law for employers to retaliate against anyone who asserts their rights under the law. Retaliation subjects an employer to civil penalties, a private lawsuit or both.

Independent Contractors: If you are an independent contractor**, you must pay all taxes and Unemployment Insurance contributions required by New York State and Federal Law.**

Penalties for paying workers off the books or improperly treating employees as independent contractors:

- **Civil Penalty** — First offense: Up to $2,500 per employee

  Subsequent offense(s): Up to $5,000 per employee

- **Criminal Penalty** — First offense: Misdemeanor - up to 30 days in jail, up to a $25,000 fine and debarment from performing public work for up to one year.

  Subsequent offense(s): Misdemeanor - up to 60 days in jail or up to a $50,000 fine and debarment from performing public work for up to 5 years.

If you have questions about your employment status or believe that your employer may have violated your rights and you want to file a complaint, call the Department of Labor at (866) 435-1499 or send an email to dol.misclassified@labor.ny.gov. All complaints of fraud and violations are taken seriously. You can remain anonymous.

Employer Name:

IA 999 (09/16)

WE ARE YOUR DOL

NEW YORK STATE Department of Labor

New York State Department of Labor
Bureau of Public Work

Attention Employees

THIS IS A:

PUBLIC WORK PROJECT

If you are employed on this project as a **worker, laborer, or mechanic** you are entitled to receive the **prevailing wage and supplements rate** for the classification at which you are working.

Your pay stub and wage notice received upon hire must clearly state your wage rate and supplement rate.

Chapter 629 of the Labor Laws of 2007:

These wages are set by law and must be posted at the work site. They can also be found at: https://dol.ny.gov/bureau-public-work

If you feel that you have not received proper wages or benefits, please call our nearest office.*

Albany	(518) 457-2744	Patchogue	(631) 687-4882
Binghamton	(607) 721-8005	Rochester	(585) 258-4505
Buffalo	(716) 847-7159	Syracuse	(315) 428-4056
Garden City	(516) 228-3915	Utica	(315) 793-2314
New York City	(212) 932-2419	White Plains	(914) 997-9507
Newburgh	(845) 568-5287		

* For New York City government agency construction projects, please contact the Office of the NYC Comptroller at (212) 669-4443, or www.comptroller.nyc.gov – click on Bureau of Labor Law.

Contractor Name: _____

Project Location: _____

Requirements for OSHA 10 Compliance

Article 8 §220-h requires that when the advertised specifications, for every contract for public work, is $250,000.00 or more the contract must contain a provision requiring that every worker employed in the performance of a public work contract shall be certified as having completed an OSHA 10 safety training course. The clear intent of this provision is to require that all employees of public work contractors, required to be paid prevailing rates, receive such training “prior to the performing any work on the project.”

The Bureau will enforce the statute as follows:

All contractors and sub contractors must attach a copy of proof of completion of the OSHA 10 course to the first certified payroll submitted to the contracting agency and on each succeeding payroll where any new or additional employee is first listed.

Proof of completion may include but is not limited to:

- Copies of bona fide course completion card (*Note: Completion cards do not have an expiration date.)*
- Training roster, attendance record of other documentation from the certified trainer pending the issuance of the card.
- Other valid proof

**A certification by the employer attesting that all employees have completed such a course is not sufficient proof that the course has been completed.

Any questions regarding this statute may be directed to the New York State Department of Labor, Bureau of Public Work at 518-457-5589.

WICKS

Public work projects are subject to the Wicks Law requiring separate specifications and bidding for the plumbing, heating and electrical work, when the total project's threshold is $3 million in Bronx, Kings, New York, Queens and, Richmond counties; $1.5 million in Nassau, Suffolk and Westchester counties; and $500,000 in all other counties.

For projects below the monetary threshold, bidders must submit a sealed list naming each subcontractor for the plumbing, HVAC and electrical and the amount to be paid to each. The list may not be changed unless the public owner finds a legitimate construction need, including a change in specifications or costs or the use of a Project Labor Agreement (PLA), and must be open to public inspection.

Allows the state and local agencies and authorities to waive the Wicks Law and use a PLA if it will provide the best work at the lowest possible price. If a PLA is used, all contractors shall participate in apprentice training programs in the trades of work it employs that have been approved by the Department of Labor (DOL) for not less than three years. They shall also have at least one graduate in the last three years and use affirmative efforts to retain minority apprentices. PLA's would be exempt from Wicks, but deemed to be public work subject to prevailing wage enforcement.

The Commissioner of Labor shall have the power to enforce separate specification requirement s on projects, and may issue stop-bid orders against public owners for non-compliance.

Other new monetary thresholds, and similar sealed bidding for non-Wicks projects, would apply to certain public authorities including municipal housing authorities, NYC Construction Fund, Yonkers Educational Construction Fund, NYC Municipal Water Finance Authority, Buffalo Municipal Water Finance Authority, Westchester County Health Care Association, Nassau County Health Care Corp., Clifton-Fine Health Care Corp., Erie County Medical Center Corp., NYC Solid Waste Management Facilities, and the Dormitory Authority.

Contractors must pay subcontractors within a 7 days period.

(07.19)

Introduction to the Prevailing Rate Schedule

Information About Prevailing Rate Schedule

This information is provided to assist you in the interpretation of particular requirements for each classification of worker contained in the attached Schedule of Prevailing Rates.

Classification

It is the duty of the Commissioner of Labor to make the proper classification of workers taking into account whether the work is heavy and highway, building, sewer and water, tunnel work, or residential, and to make a determination of wages and supplements to be paid or provided. It is the responsibility of the public work contractor to use the proper rate. If there is a question on the proper classification to be used, please call the district office located nearest the project. District office locations and phone numbers are listed below.

Prevailing Wage Schedules are issued separately for "General Construction Projects" and "Residential Construction Projects" on a county-by-county basis.

General Construction Rates apply to projects such as: Buildings, Heavy & Highway, and Tunnel and Water & Sewer rates.

Residential Construction Rates generally apply to construction, reconstruction, repair, alteration, or demolition of one family, two family, row housing, or rental type units intended for residential use.

Some rates listed in the Residential Construction Rate Schedule have a very limited applicability listed along with the rate. Rates for occupations or locations not shown on the residential schedule must be obtained from the General Construction Rate Schedule. Please contact the local Bureau of Public Work office before using Residential Rate Schedules, to ensure that the project meets the required criteria.

Payrolls and Payroll Records

Contractors and subcontractors are required to establish, maintain, and preserve for not less that six (6) years, contemporaneous, true, and accurate payroll records.

Every contractor and subcontractor shall submit to the Department of Jurisdiction (Contracting Agency), within thirty (30) days after issuance of its first payroll and every thirty (30) days thereafter, a transcript of the original payrolls, subscribed and affirmed as true under penalty of perjury.

Paid Holidays

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

Overtime

At a minimum, all work performed on a public work project in excess of eight hours in any one day or more than five days in any workweek is overtime. However, the specific overtime requirements for each trade or occupation on a public work project may differ. Specific overtime requirements for each trade or occupation are contained in the prevailing rate schedules.

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays.

The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Supplemental Benefits

Particular attention should be given to the supplemental benefit requirements. Although in most cases the payment or provision of supplements is straight time for all hours worked, some classifications require the payment or provision of supplements, or a portion of the supplements, to be paid or provided at a premium rate for premium hours worked. Supplements may also be required to be paid or provided on paid holidays, regardless of whether the day is worked. The Overtime Codes and Notes listed on the particular wage classification will indicate these conditions as required.

Effective Dates

When you review the schedule for a particular occupation, your attention should be directed to the dates above the column of rates. These are the dates for which a given set of rates is effective. The rate listed is valid until the next effective rate change or until the new annual determination which takes effect on July 1 of each year. All contractors and subcontractors are required to pay the current prevailing rates of wages and supplements. If you have any questions please contact the Bureau of Public Work or visit the New York State Department of Labor website (www.labor.ny.gov) for current wage rate information.

Apprentice Training Ratios

The following are the allowable ratios of registered Apprentices to Journey-workers.

For example, the ratio 1:1,1:3 indicates the allowable initial ratio is one Apprentice to one Journeyworker. The Journeyworker must be in place on the project before an Apprentice is allowed. Then three additional Journeyworkers are needed before a second Apprentice is allowed. The last ratio repeats indefinitely. Therefore, three more Journeyworkers must be present before a third Apprentice can be hired, and so on.

Please call Apprentice Training Central Office at (518) 457-6820 if you have any questions.

Title (Trade)	Ratio
Boilermaker (Construction)	1:1,1:4
Boilermaker (Shop)	1:1,1:3
Carpenter (Bldg.,H&H, Pile Driver/Dockbuilder)	1:1,1:4
Carpenter (Residential)	1:1,1:3
Electrical (Outside) Lineman	1:1,1:2
Electrician (Inside)	1:1,1:3
Elevator/Escalator Construction & Modernizer	1:1,1:2
Glazier	1:1,1:3
Insulation & Asbestos Worker	1:1,1:3
Iron Worker	1:1,1:4
Laborer	1:1,1:3
Mason	1:1,1:4
Millwright	1:1,1:4
Op Engineer	1:1,1:5
Painter	1:1,1:3
Plumber & Steamfitter	1:1,1:3
Roofer	1:1,1:2
Sheet Metal Worker	1:1,1:3
Sprinkler Fitter	1:1,1:2

If you have any questions concerning the attached schedule or would like additional information, please contact the nearest BUREAU of PUBLIC WORK District Office or write to:

New York State Department of Labor
Bureau of Public Work
State Office Campus, Bldg. 12
Albany, NY 12226

District Office Locations:	Telephone #	FAX #
Bureau of Public Work - Albany	518-457-2744	518-485-0240
Bureau of Public Work - Binghamton	607-721-8005	607-721-8004
Bureau of Public Work - Buffalo	716-847-7159	716-847-7650
Bureau of Public Work - Garden City	516-228-3915	516-794-3518
Bureau of Public Work - Newburgh	845-568-5287	845-568-5332
Bureau of Public Work - New York City	212-932-2419	212-775-3579
Bureau of Public Work - Patchogue	631-687-4882	631-687-4902
Bureau of Public Work - Rochester	585-258-4505	585-258-4708
Bureau of Public Work - Syracuse	315-428-4056	315-428-4671
Bureau of Public Work - Utica	315-793-2314	315-793-2514
Bureau of Public Work - White Plains	914-997-9507	914-997-9523
Bureau of Public Work - Central Office	518-457-5589	518-485-1870

Westchester County General Construction

Boilermaker — 08/01/2024

JOB DESCRIPTION Boilermaker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES

Per Hour:	07/01/2024	01/01/2025
Boilermaker	$ 67.38	$ 68.88
Repairs & Renovations	67.38	68.88

Repairs & Renovation: Includes Repairing, Renovating replacement of parts to an existing unit(s).

SUPPLEMENTAL BENEFITS
Per Hour:

Boilermaker Repair & Renovations	33.5% of hourly Wage Paid + $ 26.85	33.5% of Hourly Wage Paid + $26.85

NOTE: "Hourly Wage Paid" shall include any and all premium(s) pay.

Repairs & Renovation Includes replacement of parts and repairs & renovation of existing unit.

OVERTIME PAY
See (*B, O, **U) on OVERTIME PAGE
Note:* Includes 9th & 10th hours, double for 11th or more.
** Labor Day ONLY, if worked.

Repairs & Renovation see (B,E,Q) on OT Page

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 12, 15, 25, 26, 29) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:
(1/2) Year Terms at the following percentage of Boilermaker's Wage

1st	2nd	3rd	4th	5th	6th	7th
65%	70%	75%	80%	85%	90%	95%

Supplemental Benefits Per Hour:

	33.5% of Hourly Wage Paid Plus Amount Below	33.5% of Hourly Wage Paid Plus Amount Below
1st Term	$ 20.36	$ 20.36
2nd Term	21.28	21.28
3rd Term	22.22	22.22
4th Term	23.12	23.12
5th Term	24.07	24.07
6th Term	25.00	25.00
7th Term	25.93	25.93

NOTE: "Hourly Wage Paid" shall include any and all premium(s)

4-5

Carpenter — 08/01/2024

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2024

Piledriver $ 60.59
+ 10.00*

Dockbuilder $ 60.59
+ 10.00*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker $ 45.79

OVERTIME PAY
See (B, E2, O) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE.

Paid: for 1st & 2nd yr.
Apprentices See (5,6,11,13,25)

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour
(1)year terms:

1st	2nd	3rd	4th
$26.98	$32.58	$40.96	$49.35
+ 5.50*	+ 5.50*	+ 5.50*	+ 5.50*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:

All Terms: $ 32.34

8-1556 Db

Carpenter — 08/01/2024

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2024

Carpet/Resilient
Floor Coverer $ 55.05
+ 8.25*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

INCLUDES HANDLING & INSTALLATION OF ARTIFICIAL TURF AND SIMILAR TURF INDOORS/OUTDOORS.

SUPPLEMENTAL BENEFITS
Per hour:
$ 39.45

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18, 19) on HOLIDAY PAGE.

Paid for 1st & 2nd yr.
Apprentices See (5,6,11,13,16,18,19,25)
Overtime: See (5,6,11,13,16,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wage per hour - (1) year terms:

1st	2nd	3rd	4th
$ 25.20	$ 28.20	$ 32.45	$ 40.33

+ 1.85*	+ 2.35*	+ 2.85*	+ 3.85*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:

1st	2nd	3rd	4th
$ 15.22	$ 16.22	$ 19.32	$ 20.32

8-2287

Carpenter **08/01/2024**

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per Hour: 07/01/2024

Marine Construction:

Marine Diver	$ 75.46
	+ 10.00*
Marine Tender	$ 55.00
	+ 10.00*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker	$ 45.65

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18, 19) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 13, 16, 18, 19, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:
One (1) year terms.

1st year	$ 26.98
	+ 5.50*
2nd year	32.58
	+ 5.50*
3rd year	40.96
	+ 5.50*
4th year	49.35
	+ 5.50*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits
Per Hour:

All terms	$ 32.20

8-1456MC

Carpenter **08/01/2024**

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per hour: 07/01/2024

Building
Millwright $ 59.35
+ 13.12*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Millwright $ 45.41

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (18, 19) on HOLIDAY PAGE
Paid: See (18,19) on HOLIDAY PAGE.

Overtime See (5,6,8,11,13,18,19,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour:
One (1) year terms:

1st.	2nd.	3rd.	4th.
$ 32.16	$ 37.61	$ 43.06	$ 53.96
+ 7.08*	+ 8.25*	+ 9.42*	+ 11.76*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:
One (1) year terms:

1st.	2nd.	3rd.	4th.
$ 30.56	$ 33.09	$ 36.27	$ 40.69

8-740.1

Carpenter **08/01/2024**

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Per Hour:
07/01/2024

Timberman $ 55.59
+ 10.26*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per Hour:
07/01/2024

$ 44.96

OVERTIME PAY
See (B, E, E2, Q) on OVERTIME PAGE

HOLIDAY
Overtime: See (5, 6, 11, 13, 25) on HOLIDAY PAGE
Paid: See (1) on HOLIDAY PAGE.

Paid: for 1st & 2nd yr.
Apprentices See (5,6,11,13,25)

Overtime: See (5,6,11,13,25) on HOLIDAY PAGE.

REGISTERED APPRENTICES
Wages per hour:
One (1) year terms:

1st	2nd	3rd	4th

$24.96	$30.07	$37.72	$45.38
+ 5.55*	+ 5.55*	+ 5.55*	+ 5.55*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental benefits per hour:
All terms $ 31.95

8-1556 Tm

Carpenter — 08/01/2024

JOB DESCRIPTION Carpenter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Westchester

PARTIAL COUNTIES
Orange: South of but including the following, Waterloo Mills, Slate Hill, New Hampton, Goshen, Blooming Grove, Mountainville, east to the Hudson River.
Putnam: South of but including the following, Cold Spring, TompkinsCorner, Mahopac, Croton Falls, east to Connecticut border.
Suffolk: West of Port Jefferson and Patchogue Road to Route 112 to the Atlantic Ocean.

WAGES
Per hour: 07/01/2024

Core Drilling:
Driller $ 46.25
+ 3.25*

Driller Helper $ 36.28
+ 3.25*

Note: Hazardous Waste Pay Differential:
For Level C, an additional 15% above wage rate per hour
For Level B, an additional 15% above wage rate per hour
For Level A, an additional 15% above wage rate per hour
Note: When required to work on water: an additional $ 3.00 per hour.

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS

Per hour:

Driller and Helper $ 30.24

OVERTIME PAY
See (B, G, P) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE

8-1536-CoreDriller

Carpenter - Building / Heavy&Highway — 08/01/2024

JOB DESCRIPTION Carpenter - Building / Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Putnam, Rockland, Westchester

WAGES
WAGES:(per hour)
Applies to CAPRENTER BUILDING/HEAVY & HIGHWAY/TUNNEL:

	07/01/2024	07/01/2025 Additional	07/01/2026 Additional
Base Wage	$ 42.76 +$6.62*	$ 1.25**	$ 1.25**

*For all hours paid straight or premium.
**To be allocated at a later date.

SHIFT WORK

SHIFT DIFFERENTIAL: When it is mandated by a Government Agency irregular or off shift can be worked. The Carpenter shall receive an additional fifteen percent (15%) of wage plus applicable benefits.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker $ 31.60

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
BUILDING:
Paid: See (1) on HOLIDAY PAGE.
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE.
- Holidays that fall on Sunday will be observed Monday.

HEAVY&HIGHWAY/TUNNEL:
Paid: See (5, 6, 25) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
- Holidays that fall on Sunday will be observed Monday
- Must be employed during the five (5) work days immediately preceding a holiday or during the five (5) work days following the paid holiday to receive holiday pay
- If Employee is entitled to a paid holiday, the Employee is paid the Holiday wage and supplemental benefits whether they work or not. If Employee works the Holiday, the Employee will receive holiday pay (including supplemental benefits), plus the applicable premium wage for working the Holiday. If Employee works in excess of 8 hours on Holiday, then benefits will be paid for any hours in excess of 8 hours.

REGISTERED APPRENTICES
1 year terms at the following wage rates:

1st	2nd	3rd	4th
$ 21.38	$ 25.66	$ 29.93	$ 34.21
+3.84*	+3.84*	+3.84*	+3.84*

*For all hours paid straight or premium

SUPPLEMENTAL BENEFITS per hour:

All terms $ 16.25

11-279.1B/HH

Electrician **08/01/2024**

JOB DESCRIPTION Electrician **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Queens, Richmond, Westchester

WAGES
Per hour: 07/01/2024

Service Technician $ 37.40

Service and Maintenance on Alarm and Security Systems.

Maintenance, repair and /or replacement of defective (or damaged) equipment on, but not limited to, Burglar - Fire - Security - CCTV - Card Access - Life Safety Systems and associated devices. (Whether by service contract of T&M by customer request.)

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker: $ 21.85

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 16, 17, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 17, 25, 26) on HOLIDAY PAGE

9-3H

Electrician **08/01/2024**

JOB DESCRIPTION Electrician **DISTRICT** 8

ENTIRE COUNTIES
Westchester

WAGES

Per hour:	07/01/2024	04/17/2025
*Electrician/A-Technician	$ 56.75	$ 58.75
Teledata	56.75	58.75

*All new installations of wiring, conduit, junction boxes and light fixtures for projects with a base bid of more than $325,000. For projects with a base bid of $325,000 or less, see Maintenance and Repair rates.

Note: On a job where employees are required to work on bridges over navigable waters, transmission towers, light poles, bosun chairs, swinging scaffolds , etc. 40 feet or more above the water or ground or under compressed air, or tunnel projects under construction or where assisted breathing apparatus is required, they will be paid at the rate of time and one-half for such work except on normal pole line or building construction work.

SUPPLEMENTAL BENEFITS

Per hour:		
Journeyworker	$ 59.39	$61.09

OVERTIME PAY
See (A, G, *J, P) on OVERTIME PAGE
*NOTE: Emergency work on Sunday and Holidays is at the time and one-half overtime rate.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1) year terms at the following wage rates:

	07/01/2024	04/17/2025
1st term	$ 16.00	$16.00
2nd term	17.00	17.00
3rd term	19.00	19.00
4th term	21.00	21.00
MIJ 1-12 months	26.50	26.50
MIJ 13-18 months	30.00	30.00

Supplemental Benefits per hour:

	07/01/2024	04/17/2025
1st term	$ 12.40	$ 12.72
2nd term	15.07	15.89
3rd term	16.40	17.23
4th term	17.73	18.57
MIJ 1-12 months	15.72	15.89
MIJ 13-18 months	16.17	16.29

8-3/W

Electrician — 08/01/2024

JOB DESCRIPTION Electrician **DISTRICT** 8

ENTIRE COUNTIES
Westchester

WAGES
Per hour

	07/01/2024	04/17/2025
Electrician -M	$ 30.00	$ 30.00
H - Telephone	30.00	30.00

All work with a base bid amount of $325,000 or less. Including repairs and /or replacement of defective electrical and teledata equipment, all work necessary to retrofit, service, maintain and repair all kinds of lighting fixtures and local lighting controls, and washing and cleaning of foregoing fixtures.

*If the project exceeds $375,000 due to changes in the scope of work, an Electrician/A Technician must be part of the labor ratio.

SUPPLEMENTAL BENEFITS

	07/01/2024	04/17/2025
Electrician & H - Telephone	$ 16.17	$ 16.29

OVERTIME PAY
See (B, G, *J, P) on OVERTIME PAGE
*Note: Emergency work on Sunday and Holidays is at the time and one-half overtime rate.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

8-3m

Elevator Constructor — 08/01/2024

JOB DESCRIPTION Elevator Constructor **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk

PARTIAL COUNTIES
Rockland: Entire County except for the Township of Stony Point
Westchester: Entire County except for the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

WAGES
Per hour:

	07/01/2024	03/17/2025
Elevator Constructor	$ 80.35	$ 83.37
Modernization & Service/Repair	63.16	65.54

SUPPLEMENTAL BENEFITS
Per Hour:

Elevator Constructor	$ 46.367	$ 47.654
Modernization & Service/Repairs	45.217	46.470

OVERTIME PAY
Constructor See (D, M, T) on OVERTIME PAGE.

Modern/Service See (B, F, S) on OVERTIME PAGE.

HOLIDAY
Paid: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES PER HOUR:

6 MONTH TERMS:

1st Term*	2nd & 3rd Term*	4th & 5th Term	6th & 7th Term	8th & 9th Term
50%	50%	55%	65%	75%

* Note: 1st, 2nd, 3rd Terms are based on Average wage of Constructor, Modernization & Service.
Terms 4 thru 9 Based on Journeyman's wage of classification Working in.

SUPPLEMENTAL BENEFITS:

	07/01/2024	03/17/2025
Elevator Constructor		
1st Term	$ 0.00	$ 0.00
2nd & 3rd Term	36.15	36.90
4th & 5th Term	37.19	37.99
6th & 7th Term	38.80	39.70
8th & 9th Term	40.41	41.40
Modernization & Service/Repair		
1st Term	$ 0.00	$ 0.00
2nd & 3rd Term	36.15	36.90
4th & 5th Term	37.19	37.99
6th & 7th Term	38.80	39.70

8th & 9th Term	40.41	41.40

4-1

Elevator Constructor — 08/01/2024

JOB DESCRIPTION Elevator Constructor **DISTRICT** 1

ENTIRE COUNTIES
Columbia, Dutchess, Greene, Orange, Putnam, Sullivan, Ulster

PARTIAL COUNTIES
Delaware: Towns of Andes, Bovina, Colchester, Davenport, Delhi, Harpersfield, Hemdon, Kortright, Meredith, Middletown, Roxbury, Hancock & Stamford
Rockland: Only the Township of Stony Point.
Westchester: Only the Townships of Bedford, Lewisboro, Cortland, Mt. Kisco, North Salem, Pound Ridge, Somers and Yorktown.

WAGES

Per Hour	07/01/2024	01/01/2025
Mechanic	$ 70.15	$ 73.07
Helper	70% of Mechanic Wage Rate	70% of Mechanic Wage Rate

SUPPLEMENTAL BENEFITS
Per hour

	07/01/2024	01/01/2025
Journeyworker/Helper	$ 37.885*	$ 38.435*

(*)Plus 6% of regular hourly if less than 5 years of service. Plus 8% of regular hourly rate if more than 5 years of service.

OVERTIME PAY
See (D, O) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 15, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 16) on HOLIDAY PAGE
Note: When a paid holiday falls on Saturday, it shall be observed on Friday. When a paid holiday falls on Sunday, it shall be observed on Monday.

REGISTERED APPRENTICES
Wages per hour:

0-6 mo*	6-12 mo	2nd yr	3rd yr	4th yr
50 %	55 %	65 %	70 %	80 %

(*)Plus 6% of the hourly rate, no additional supplemental benefits.

Supplemental Benefits per hour worked:

Same as Journeyperson/Helper

1-138

Glazier — 08/01/2024

JOB DESCRIPTION Glazier **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES
Per hour:

	07/01/2024	05/01/2025 Additional
Glazier, Glass Tinting and Window Film	$ 63.28	$ 1.11***
Scaffolding, including swing scaffold	67.28	
*Mechanical Equipment	64.28	
**Repair & Maintenance	30.76	

*Mechanical equipment, scissor jacks, man lifts, booms & buckets 30' or more, but not pipe scaffolding.
**Repair & Maintenance- All repair & maintenance work on a particular building whenever performed, where the total cumulative Repair & Maintenance contract value is under $193,000.

***To be allocated at a later date.

SUPPLEMENTAL BENEFITS

Per hour:	7/01/2024
Glazier, Glass Tinting Window Film, Scaffolding and Mechanical Equipment	$ 42.13
Repair & Maintenance	24.62

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE
For 'Repair & Maintenance' see (B, B2, I, S) on overtime page.

HOLIDAY
Paid: See (5, 6, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE
For 'Repair & Maintenance'
Paid: See(5, 6, 16, 25)
Overtime: See(5, 6, 16, 25)

REGISTERED APPRENTICES
Wage per hour:
(1) year terms at the following wage rates:

	7/01/2024
1st term	$ 22.34
2nd term	30.64
3rd term	40.87
4th term	50.14

Supplemental Benefits:
(Per hour)

1st term	$ 19.27
2nd term	27.34
3rd term	32.85
4th term	36.01

8-1087 (DC9 NYC)

Insulator - Heat & Frost — 08/01/2024

JOB DESCRIPTION Insulator - Heat & Frost **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2024
Insulators Heat & Frost	$ 71.01

SUPPLEMENTAL BENEFITS

Per Hour:	
Insulators Heat & Frost	$ 36.76

OVERTIME PAY
See (B, E, *Q, V) on OVERTIME PAGE
* Triple time for Labor Day (If worked)

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages:
1 year terms.
Wages Per Hour:

1st	2nd	3rd	4th
$ 31.96	$ 39.06	$ 46.16	$ 53.26

Supplemental Benefits:

$ 16.56	$ 20.23	$ 23.91	$ 27.06

4-12

Insulator - Heat & Frost — 08/01/2024

JOB DESCRIPTION Insulator - Heat & Frost **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Westchester

WAGES

Per hour:	07/01/2024
Insulator	$ 60.85
Discomfort & Additional Training**	63.92
Fire Stop Work*	32.97

* Applies on all exclusive Fire Stop Work (When contract is for Fire Stop work only). No apprentices on these contracts only.

**Applies to work requiring; garb or equipment worn against the body not customarily worn by insulators; psychological evaluation ;special training, including but not limited to "Yellow Badge" radiation training

Note: Additional $0.50 per hour for work 30 feet or more above floor or ground level.

SUPPLEMENTAL BENEFITS

Per hour:	
Journeyworker	$ 38.25
Discomfort & Additional Training	40.32
Fire Stop Work:	
Journeyworker	19.48

OVERTIME PAY
See (B, E, E2, Q, *T) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Note: Last working day preceding Christmas and New Years day, workers shall work no later than 12:00 noon and shall receive 8 hrs pay.

Overtime: See (2*, 4, 6, 16, 25) on HOLIDAY PAGE.
*Note: Labor Day triple time if worked.

REGISTERED APPRENTICES
(1) year terms:

Insulator Apprentices:

1st	2nd	3rd	4th
$ 32.97	$ 38.54	$ 44.12	$ 49.70

Discomfort & Additional Training Apprentices:

1st	2nd	3rd	4th
$ 34.51	$ 40.38	$ 46.27	$ 52.16

Supplemental Benefits paid per hour:

Insulator Apprentices:

1st term	$ 19.48
2nd term	23.23
3rd term	26.98
4th term	30.74

Discomfort & Additional Training Apprentices:

1st term	$ 20.50
2nd term	24.47

3rd term	28.43
4th term	32.39

8-91

Ironworker **08/01/2024**

JOB DESCRIPTION Ironworker **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2024	01/01/2025 Additional
Stone Derrickmen Rigger	$ 75.40	$ 1.64*
Stone Handset Derrickman	72.55	1.11*

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per hour:

Stone Derrickmen Rigger	$ 45.52
Stone Handset Derrickman	44.76

OVERTIME PAY
See (B, D1, *E, Q, **V) on OVERTIME PAGE
*Time and one-half shall be paid for all work on Saturday up to eight (8) hours and double time shall be paid for all work thereafter.
** Benefits same premium as wages on Holidays only

HOLIDAY
Paid: See (18) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 25) on HOLIDAY PAGE
Work stops at schedule lunch break with full day's pay.

REGISTERED APPRENTICES
Wage per hour:

Stone Derrickmen Rigger:

	1st	2nd	3rd	4th
07/01/2024	$ 37.20	$ 53.28	$ 59.32	$ 65.36

Supplemental Benefits:
Per hour:

07/01/2024	23.27	34.39	34.39	34.39

Stone Handset:

1/2 year terms at the following hourly wage rate:

	1st	2nd	3rd	4th
07/01/2024	$ 35.78	$ 51.04	$ 56.79	$ 62.55

Supplemental Benefits:
Per hour:

07/01/2024	22.95	34.08	34.08	34.08

9-197D/R

Ironworker **08/01/2024**

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per Hour:	07/01/2024	01/01/2025
Ornamental	$ 47.65	Additional
Chain Link Fence	47.65	$ 1.25/hr*

Guide Rail	47.65

(*)To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker: $ 66.29

OVERTIME PAY
See (B, B1, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
1 year terms

	07/01/2024
1st Term	$ 25.98
2nd Term	28.45
3rd Term	30.80
4th Term	34.39

Supplemental Benefits per hour:

1st Term	$ 16.29
2nd Term	18.29
3rd Term	19.29
4th Term	20.29

4-580-Or

Ironworker 08/01/2024

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
PER HOUR:

	07/01/2024	01/01/2025
Ironworker:		Additional
Structural	$ 57.20	$ 1.75/Hr.*
Bridges		
Machinery		

(*)To be allocated at a later date.

SUPPLEMENTAL BENEFITS
PER HOUR PAID:

Journeyman	$ 89.85

OVERTIME PAY
See (B, B1, Q, *V) on OVERTIME PAGE
*NOTE: Benefits are calculated for every hour paid.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 18, 19) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES PER HOUR:

6 month terms at the following rate:

1st	$ 30.23
2nd	30.83
3rd - 6th	31.44

Supplemental Benefits
PER HOUR PAID: 62.47

4-40/361-Str

Ironworker 08/01/2024

JOB DESCRIPTION Ironworker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES
Rockland: Southern section - south of Convent Road and east of Blue Hills Road.

WAGES

Per hour:	07/01/2024
Reinforcing & Metal Lathing	$ 56.95
"Base" Wage	55.20 plus $ 1.75

"Base" Wage is used to calculate overtime hours only.

SUPPLEMENTAL BENEFITS

Per hour:	
Reinforcing & Metal Lathing	$ 44.63

OVERTIME PAY
See (B, E, Q, *X) on OVERTIME PAGE
*Only $23.50 per Hour for non worked hours

Supplemental Benefit Premiums for Overtime Hours worked:

Time & One Half	$ 51.13
Double Time	57.63

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 11, 13, *18, **19, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1) year terms at the following wage rates:

Prior to 01/01/2020:

1st term	2nd term	3rd term	4th Term
Wage Per Hour:			
$ 22.55	$ 28.38	$ 34.68	$ 37.18
"Base" Wage			
$21.00	$26.80	$33.10	$35.60
plus $1.55	plus $1.58	plus $1.58	plus $1.58

"Base" Wage is used to calculate overtime hours ONLY.

SUPPLEMENTAL BENIFITS
Per Hour:

1st term	2nd term	3rd term	4th Term
$18.17	$21.34	$22.00	$22.50

After 01/01/2020:

1st term	2nd term	3rd term	4th Term
Wage Per Hour:			
$ 22.55	$ 23.60	$ 24.60	$ 25.65
"Base" Wage			
$21.00	$22.00	$23.00	$24.00
plus $1.55	plus $1.60	plus $1.60	plus $1.65

"Base" Wage is used to calculate overtime hours ONLY.

SUPPLEMENTAL BENIFITS
Per Hour:

1st term	2nd term	3rd term	4th Term
$18.40	$17.40	$16.45	$15.45

4-46Reinf

Laborer - Building 08/01/2024

JOB DESCRIPTION Laborer - Building **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

WAGES

Per hour	07/01/2024
Laborer	$ 43.40 plus $5.45**
Laborer/Asbestos & Hazardous Materials Removal	$ 45.05* plus $5.45**

* Abatement/Removal of:
- Lead based or lead containing paint on materials to be repainted is classified as Painter.
- Asbestos containing roofs and roofing material is classified as Roofer.

** This portion is not subject to overtime premium.

NOTE: Upgrade/Material condition work plan for work performed during non-outage under a wage formula of 90% wage/100% fringe benefits at nuclear power plants.

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2024
Journeyworker	$ 31.95

OVERTIME PAY
See (B, E, E2, Q, *V) on OVERTIME PAGE
*Note: For Sundays and Holidays worked benefits are at the same premium as wages.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
LABORER ONLY
Hourly terms at the following wage:

Level A	Level B	Level C	Level D
0-1000	1001-2000	2001-3000	3001-4000
$ 28.08	$ 31.90	$ 35.72	$ 39.54

Supplemental Benefits per hour:

Apprentices	
All terms	$ 23.60

8-235/B

Laborer - Heavy&Highway 08/01/2024

JOB DESCRIPTION Laborer - Heavy&Highway **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

WAGES
PUTNAM: APPLIES TO ALL HEAVY & HIGHWAY WORK EXCLUDING HIGHWAYS, STREETS, AND BRIDGES

GROUP I: Blaster, Quarry Master, Curbs/Asphalt Screedman, Pipe Jacking and Boring Operations Operator, Qualified Dead Condition Pipe Fuser (B Mechanic)

GROUP II: Burner, Drillers(jumbo, joy, wagon, air track, hydraulic), Drill Operator, Self Contained Rotary Drill, Curbs, Raker, Bar Person, Concrete Finisher.

GROUP III: Pavement Breakers, Jeeper Operator, Jack Hammer, Pneumatic Tools (all), Gas Driller, Guniting, Railroad Spike Puller, Pipelayer, Chain Saw, Deck winches on scows, Power Buggy Operator, Power Wheelbarrow Operator, Bar Person Helper, Compressed Airlance, Water Jet Lance.

GROUP IV: Concrete Laborers, Asph. Worker, Rock Scaler, Vibrator Oper., Bit Grinder, Air Tamper, Pumps, Epoxy (adhesives, fillers and troweled on), Barco Rammer, Concrete Grinder, Crack Router Operator, Guide Rail-digging holes and placing concrete and demolition when not to be replaced, distribution of materials and tightening of bolts.

GROUP V: Drillers Helpers, Common Laborer, Mason Tenders, Signal Person, Pit Person, Truck Spotter, Powder Person, Landscape/Nursery Person, Dump Person, Temp. Heat.

GROUP VIA: Asbestos/Toxic Waste Laborer-All removal (Roads, Tunnels, Landfills, etc.) Confined space laborer, Bio-remediation, Phyto-remediation, Lead or Hazardous material, Abatement Laborer.

Wages:(per hour)	07/01/2024
GROUP I	$ 50.62*
GROUP II	49.27*
GROUP III	48.87*
GROUP IV	48.52*
GROUP V	48.17*
GROUP VIA	50.17*
Operator Qualified	
Gas Mechanic(A Mech)	60.62*
Flagperson	41.82*

*NOTE: To calculate overtime premiums, deduct $0.10 from above wages

SHIFT WORK
A shift premium will be paid on Public Work contracts for off-shift or irregular shift work when mandated by the NYS D.O.T. or other Governmental Agency contracts. Employees shall receive an additional 15% per hour above current rate for all regular and irregular shift work. Premium pay shall be calculated using the 15% per hour differential as base rate.

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker:
First 40 Hours
Per Hour $ 27.78
Over 40 Hours
Per Hour 21.03

OVERTIME PAY
See (B, E, P, R, S) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
NOTE: For Holiday Overtime: 5, 6 - Code 'S' applies
For Holiday Overtime: 8, 15, 25, 26 - Code 'R' applies

REGISTERED APPRENTICES

	1st term	2nd term	3rd term	4th term
	1-1000hrs	1001-2000hrs	2001-3000hrs	3001-4000hrs
07/01/2024	$ 28.07	$ 33.12	$ 37.94	$ 42.76

Supplemental Benefits per hour:
1st term $ 3.85 - After 40 hours: $ 3.50
2nd term $ 3.95 - After 40 hours: 3.50
3rd term $ 4.45 - After 40 hours: 3.90
4th term $ 5.00 - After 40 hours: 4.40

8-60H/H

Laborer - Tunnel **08/01/2024**

JOB DESCRIPTION Laborer - Tunnel **DISTRICT** 11

ENTIRE COUNTIES
Columbia, Dutchess, Greene, Orange, Otsego, Putnam, Rockland, Sullivan, Ulster, Westchester

PARTIAL COUNTIES
Chenango: Townships of Columbus, Sherburne and New Berlin.
Delaware: Townships of Andes, Bovina, Middletown, Roxbury, Franklin, Hamden, Stamford, Delhi, Kortright, Harpersfield, Merideth and Davenport.

WAGES
Class 1: All support laborers/sandhogs working above the shaft or tunnel.

Class 2: All laborers/sandhogs working in the shaft or tunnel.

Class 4: Safety Miners

Class 5: Site work related to Shaft/Tunnel

WAGES: (per hour)

	07/01/2024	06/01/2025
Class 1	$ 57.05	$ 58.55
Class 2	59.20	60.70
Class 4	65.60	67.10
Class 5	49.90	51.40

Toxic and hazardous waste, lead abatement and asbestos abatement work will be paid an additional $ 3.00 an hour.

SHIFT WORK
SHIFT DIFFERENTIAL...On all Government mandated irregular shift work:
- Employee shall be paid at time and one half the regular rate Monday through Friday.
- Saturday shall be paid at 1.65 times the regular rate.
- Sunday shall be paid at 2.15 times the regular rate.

SUPPLEMENTAL BENEFITS
Per hour:

Benefit 1	$ 36.98	$ 38.23
Benefit 2	55.39	59.99
Benefit 3	74.58	76.73

Benefit 1 applies to straight time hours, paid holidays not worked.
Benefit 2 applies to over 8 hours in a day (M-F), irregular shift work hours worked, and Saturday hours worked.
Benefit 3 applies to Sunday and Holiday hours worked.

OVERTIME PAY
See (B, E, Q, X) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 15, 16, 25) on HOLIDAY PAGE
When a recognized Holidays falls on Saturday or Sunday, holidays falling on Saturday shall be recognized or observed on Friday and holidays falling on Sunday shall be recognized or observed on Monday. Employees ordered to work on the Saturday or Sunday of the holiday or on the recognized or the observed Friday or Monday for those holidays falling on Saturday or Sunday shall receive double time the established rate and benefits for the holiday.

REGISTERED APPRENTICES
FOR APPRENTICE RATES, refer to the appropriate Laborer Heavy & Highway wage rate contained in the wage schedule for the County and location where the work is to be performed.

11-17/60/235/754Tun

Lineman Electrician — 08/01/2024

JOB DESCRIPTION Lineman Electrician **DISTRICT** 6

ENTIRE COUNTIES
Westchester

WAGES
A Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors, assembly of all electrical materials, conduit, pipe or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

Crane Operators: Operation of any type of crane on line projects.
Crawler Backhoe: Operation of tracked excavator/crawler backhoe with 1/2 yard bucket or larger on line projects.
Digging Machine Operator: All other digging equipment and augering on line projects.

A Groundman/Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator equipment/operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

NOTE: Includes Teledata Work within ten (10) feet of High Voltage Transmission Lines. Also includes digging of holes for poles, anchors, footer, and foundations for electrical equipment.

Below rates apply to electrical overhead and underground distribution and maintenance work and overhead and underground transmission line work, electrical substations, switching structures, continuous pipe-type underground fluid or gas filled transmission conduit and cable installations, maintenance jobs or projects, railroad catenary installations and maintenance, third rail installations, the bonding of rails and the installation of fiber optic cable. Includes access matting for line work.

Per hour:	07/01/2024
Group A:	
Lineman, Tech, Welder	$ 61.91
Crane, Crawler Backhoe	61.91
Cable Splicer-Pipe Type	68.10
Cert. Welder-Pipe Type	65.01
Group B:	
Digging Mach Operator	55.72
Tractor Trailer Driver	52.62
Groundman, Truck Driver	49.53
Equipment Mechanic	49.53
Flagman	37.15

Additional $1.00 per hour for entire crew when a helicopter is used.

SHIFT WORK

THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM TO 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM TO 1:00 AM REGULAR RATE PLUS 17.3%
3RD SHIFT	12:30 AM TO 9:00 AM REGULAR RATE PLUS 31.4%

SUPPLEMENTAL BENEFITS

Per hour worked (but also required on non-worked holidays):

	07/01/2024
Group A	$ 30.90 *plus 7% of the hourly wage paid
Group B	$ 26.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY

See (B, E, Q, X) on OVERTIME PAGE. NOTE: Double time for emergency work designated by the Dept. of Jurisdiction.
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY

Paid	See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.
Overtime	See (5, 6, 8, 13, 25) on HOLIDAY PAGE plus Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES
WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyworker's Lineman wage.

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

	07/01/2024
	$ 26.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249aWest

Lineman Electrician - Teledata — 08/01/2024

JOB DESCRIPTION Lineman Electrician - Teledata **DISTRICT** 6

ENTIRE COUNTIES
Albany, Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Lewis, Livingston, Madison, Monroe, Montgomery, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES
Per hour:

For outside work, stopping at first point of attachment (demarcation).

	07/01/2024	01/01/2025
Cable Splicer	$ 39.24	$ 40.81
Installer, Repairman	$ 37.24	$ 38.73
Teledata Lineman	$ 37.24	$ 38.73
Tech., Equip. Operator	$ 37.24	$ 38.73
Groundman	$ 19.74	$ 20.53

NOTE: EXCLUDES Teledata work within ten (10) feet of High Voltage (600 volts and over) transmission lines. For this work please see LINEMAN.

SHIFT WORK
THE FOLLOWING RATES APPLY WHEN THE CONTRACTING AGENCY MANDATES MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION ARE WORKED. WHEN TWO (2) OR THREE (3) SHIFTS ARE WORKED THE FOLLOWING RATES APPLY:

1ST SHIFT	REGULAR RATE
2ND SHIFT	REGULAR RATE PLUS 10%
3RD SHIFT	REGULAR RATE PLUS 15%

SUPPLEMENTAL BENEFITS

Per hour:	07/01/2024	01/01/2025
Journeyworker	$ 5.70 *plus 3% of the hour wage paid	$ 5.70 *plus 3% of the hour wage paid

*The 3% is based on the hourly wage paid, straight time rate or premium rate.

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE
WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16) on HOLIDAY PAGE

6-1249LT - Teledata

Lineman Electrician - Traffic Signal, Lighting — 08/01/2024

JOB DESCRIPTION Lineman Electrician - Traffic Signal, Lighting **DISTRICT** 6

ENTIRE COUNTIES
Westchester

WAGES
Lineman/Technician shall perform all overhead aerial work. A Lineman/Technician on the ground will install all electrical panels, connect all grounds, install and connect all electrical conductors which includes, but is not limited to road loop wires; conduit and plastic or other type pipes that carry conductors, flex cables and connectors, and to oversee the encasement or burial of such conduits or pipes.

Crane Operators: Operation of any type of crane on Traffic Signal/Lighting projects.
Crawler Backhoe: Operation of tracked excavator/crawler backhoe with 1/2 yard bucket or larger on Traffic Signal/Lighting projects.
Digging Machine Operator: All other digging equipment and augering on Traffic Signal/Lighting projects.

A Groundman/Groundman Truck Driver shall: Build and set concrete forms, handle steel mesh, set footer cages, transport concrete in a wheelbarrow, hand or machine concrete vibrator, finish concrete footers, mix mortar, grout pole bases, cover and maintain footers while curing in cold weather, operate jack hammer, operate hand pavement breaker, tamper, concrete and other motorized saws, as a drill helper, operate and maintain generators, water pumps, chainsaws, sand blasting, operate mulching and seeding machine, air tools, electric tools, gas tools, load and unload materials, hand shovel and/or broom, prepare and pour mastic and other fillers, assist digger operator/equipment operator in ground excavation and restoration, landscape work and painting. Only when assisting a lineman technician, a groundman/truck driver may assist in installing conduit, pipe, cables and equipment.

A flagger's duties shall consist of traffic control only.

Per hour:	07/01/2024
Group A:	
Lineman, Technician	$ 55.95
Crane, Crawler Backhoe	55.95
Certified Welder	58.75
Group B:	
Digging Machine	50.36
Tractor Trailer Driver	47.56
Groundman, Truck Driver	44.76
Equipment Mechanic	44.76
Flagman	33.57

Above rates are applicable for installation, testing, operation, maintenance and repair on all Traffic Control (Signal) and Illumination (Lighting) projects, Traffic Monitoring Systems, and Road Weather Information Systems. Includes digging of holes for poles, anchors, footer foundations for electrical equipment; assembly of all electrical materials or raceway; placing of fish wire; pulling of cables, wires or fiber optic cable through such raceways; splicing of conductors; dismantling of such structures, lines or equipment.

SHIFT WORK
THE FOLLOWING RATES WILL APPLY ON ALL CONTRACTING AGENCY MANDATED MULTIPLE SHIFTS OF AT LEAST FIVE (5) DAYS DURATION WORKED BETWEEN THE HOURS LISTED BELOW:

1ST SHIFT	8:00 AM TO 4:30 PM REGULAR RATE
2ND SHIFT	4:30 PM TO 1:00 AM REGULAR RATE PLUS 17.3%
3RD SHIFT	12:30 AM TO 9:00 AM REGULAR RATE PLUS 31.4%

SUPPLEMENTAL BENEFITS
Per hour worked:

	07/01/2024
Group A	$ 30.90 *plus 7% of the hourly wage paid
Group B	$ 26.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

OVERTIME PAY
See (B, E, Q, X) on OVERTIME PAGE. *Note* Double time for emergency work designated by the Dept. of Jurisdiction.

WAGE CAP - Double the straight time hourly base wage shall be the maximum hourly wage compensation for any hour worked. Contractor is still responsible to pay the hourly benefit amount for each hour worked.

HOLIDAY
Paid: See (5, 6, 8, 13, 25) on HOLIDAY PAGE and Governor of NYS Election Day.
Overtime: See (5, 6, 8, 13, 25) on HOLIDAY PAGE and Governor of NYS Election Day.

NOTE: All paid holidays falling on Saturday shall be observed on the preceding Friday. All paid holidays falling on Sunday shall be observed on the following Monday. Supplements for holidays paid at straight time.

REGISTERED APPRENTICES
WAGES per hour: 1000 hour terms at the following percentage of the applicable Journeyworker's Lineman wage.

1st	2nd	3rd	4th	5th	6th	7th
60%	65%	70%	75%	80%	85%	90%

SUPPLEMENTAL BENEFITS per hour:

07/01/2024
$ 26.90 *plus 7% of the hourly wage paid

*The 7% is based on the hourly wage paid, straight time or premium time.

6-1249aWestLT

Mason - Building — 08/01/2024

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Nassau, Rockland, Suffolk, Westchester

WAGES
Per hour:

	07/01/2024	12/02/2024 Additional
Tile Setters	$ 63.91	$ 0.71*

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:

$ 27.66* + $8.50

* This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE
Work beyond 10 hours on Saturday shall be paid at double the hourly wage rate.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage per hour:

(750 hour) term at the following wage rate:
Term:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1-750	751-1500	1501-2250	2251-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6750	6501-7000
07/01/2024									
$22.19	$27.21	$34.45	$39.46	$43.07	$46.58	$50.23	$55.24	$57.71	$62.00

Supplemental Benefits per hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
07/01/2024									

$12.55* +$.76	$12.55* +$.81	$15.36* +$.91	$15.36* +$.96	$16.36* +$1.43	$17.86* +$1.48	$18.86* +$1.91	$18.86* +$1.97	$18.86* +$4.57	$24.11* +$5.18

* This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/52A

Mason - Building — 08/01/2024

JOB DESCRIPTION Mason - Building **DISTRICT** 11

ENTIRE COUNTIES
Putnam, Rockland, Westchester

PARTIAL COUNTIES
Orange: Only the Township of Tuxedo.

WAGES
Per hour:

	07/01/2024
Bricklayer	$ 47.44
Cement Mason	47.44
Plasterer/Stone Mason	47.44
Pointer/Caulker	47.44

Additional $1.00 per hour for power saw work
Additional $0.50 per hour for swing scaffold or staging work

SHIFT WORK
SHIFT WORK: When shift work or an irregular workday is mandated or required by state, federal, county, local or other governmental agency contracts, the following premiums apply:
Irregular workday requires 15% premium
Second shift an additional 15% of wage plus benefits to be paid
Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 38.50

OVERTIME PAY
OVERTIME:

Cement Mason	See (B, E, Q, W) on OVERTIME PAGE.
All Others	See (B, E, Q) on OVERTIME PAGE.

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 16, 25) on HOLIDAY PAGE

Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.

REGISTERED APPRENTICES
Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Apprentices indentured before June 1st, 2011 receive full journeyman benefits

11-5wp-b

Mason - Building — 08/01/2024

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES

Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Building

Wages per hour:	07/01/2024	01/01/2025 Additional
Mosaic & Terrazzo Mechanic	$ 60.98	$ 1.06*
Mosaic & Terrazzo Finisher	58.96	

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per hour:

Mosaic & Terrazzo Mechanic	$ 31.36* + $9.78
Mosaic & Terrazzo Finisher	$ 31.36* + $9.77

*This portion of benefits subject to same premium rate as shown for overtime wages.

OVERTIME PAY
See (A, E, Q) on OVERTIME PAGE
07/01/2024- Deduct $7.00 from hourly wages before calculating overtime.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE
Easter Sunday is an observed holiday.Holidays falling on a Saturday will be observed on that Saturday. Holidays falling on a Sunday will be celebrated on the Monday.

REGISTERED APPRENTICES
Wages Per hour:

	1st 0-1500	2nd 1501-3000	3rd 3001-3750	4th 3751-4500	5th 4501-5250	6th 5251-6000
07/01/2024	$ 25.19	$ 32.39	$ 38.18	$ 40.78	$ 49.00	$ 55.75

Supplemental Benefits per hour:

07/01/2024	$7.12* + 3.43	$9.16* + 4.40	$17.22* + 5.87	$23.86* + 6.84	$24.86* + 7.83	$27.36* + 8.80

*This portion of benefits subject to same premium rate as shown for overtime wages.

9-7/3

Mason - Building — 08/01/2024

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES
Per hour:

	07/01/2024	01/06/2025 Additional
Building-Marble Restoration:		
Marble, Stone & Terrazzo Polisher	$ 47.72	$ 0.57*

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:
Journeyworker:

Building-Marble Restoration:
Marble, Stone &
Polisher $ 31.50

OVERTIME PAY
See (B, *E, Q, V) on OVERTIME PAGE
* On Saturdays, 8th hour and successive hours paid at double hourly rate.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
WAGES per hour:

900 hour term at the following wage:

1st	2nd	3rd	4th
1-900	901-1800	1801-2700	2701
$ 33.40	$ 38.18	$ 42.94	$ 47.72

Supplemental Benefits Per Hour:

29.06	29.87	30.69	31.50

9-7/24-MP

Mason - Building — 08/01/2024

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Dutchess, Kings, Nassau, New York, Orange, Putnam, Queens, Richmond, Rockland, Suffolk, Sullivan, Ulster, Westchester

WAGES
Per Hour:

	07/01/2024	01/06/2025 Additional
Marble Cutters & Setters	$ 63.92	$ 0.75*

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:

Journeyworker $ 40.05

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage Per Hour:
07/01/2024
750 hour terms at the following wage

1st	2nd	3rd	4th	5th	6th	7th	8th
0-3000	3001-3750	3751-4500	4501-5250	5251-6000	6001-6750	6751-7500	7500+
$ 27.01	$ 40.52	$ 43.88	$ 47.26	$ 50.64	$ 54.32	$ 60.71	$ 63.92

Supplemental Benefits per hour:
07/01/2024

1st	2nd	3rd	4th	5th	6th	7th	8th
$ 26.42	$ 29.76	$ 30.61	$ 31.44	$ 32.28	$ 37.55	$ 39.23	$ 40.05

Mason - Building **08/01/2024**

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Nassau, Rockland, Suffolk, Westchester

WAGES

Per hour:	07/01/2024	12/02/2024 Additional
Tile Finisher	$ 49.08	$ 0.59*

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:

$ 24.56*
+ 8.32

*This portion of benefits is subjected to same premium rate as shown for overtime wages

OVERTIME PAY
See (B, E, Q, *V) on OVERTIME PAGE
*Work beyond 10 hours on a Saturday shall be paid at double the hourly wage rate.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25) on HOLIDAY PAGE

9-7/88A-tf

Mason - Building **08/01/2024**

JOB DESCRIPTION Mason - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2024	01/06/2025 Additional
Marble, Stone, Maintenance Finishers:	$ 27.72	$ 0.41*

Note 1: An additional $2.00 per hour for time spent grinding floor using "60 grit" and below.
Note 2: Flaming equipment operator shall be paid an additional $25.00 per day.

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per Hour:

Marble, Stone
Maintenance Finishers: $ 15.74

OVERTIME PAY
See (B, *E, Q, V) on OVERTIME PAGE
*Double hourly rate after 8 hours on Saturday

HOLIDAY
Paid: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 11, 15, 25) on HOLIDAY PAGE
1st term apprentice gets paid for all observed holidays.

REGISTERED APPRENTICES
WAGES per hour:

	07/01/2024
0-750	$ 22.32
751-1500	23.04
1501-2250	23.75
2251-3000	24.48

3001-3750	25.56
3751-4500	27.00
4501+	27.72

Supplemental Benefits:
Per hour:

0-750	12.69
751-1500	13.10
1501-2250	13.51
2251-3000	13.91
3001-3750	14.52
3751-4500	15.33
4501+	15.74

9-7/24M-MF

Mason - Building / Heavy&Highway — 08/01/2024

JOB DESCRIPTION Mason - Building / Heavy&Highway **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2024	01/06/2025 Additional
Marble-Finisher	$ 49.99	$ 0.53*

*To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Journeyworker:
Per hour

Marble- Finisher	$ 37.39

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE
Work beyond 8 hours on a Saturday shall be paid at double the rate.

HOLIDAY
Overtime: See (5, 6, 8, 11, 15, 16, 25) on HOLIDAY PAGE
When an observed holiday falls on a Sunday, it will be observed the next day.

9-7/20-MF

Mason - Heavy&Highway — 08/01/2024

JOB DESCRIPTION Mason - Heavy&Highway **DISTRICT** 11

ENTIRE COUNTIES
Putnam, Rockland, Westchester

PARTIAL COUNTIES
Orange: Only the Township of Tuxedo.

WAGES
Per hour:

	07/01/2024
Bricklayer	$ 47.94
Cement Mason	47.94
Marble/Stone Mason	47.94
Plasterer	47.94
Pointer/Caulker	47.94

Additional $1.00 per hour for power saw work
Additional $0.50 per hour for swing scaffold or staging work

SHIFT WORK
When shift work or an irregular workday is mandated or required by state, federal, county, local or other governmental contracts, the following rates apply:

Irregular workday requires 15% premium
Second shift an additional 15% of wage plus benefits to be paid

Third shift an additional 25% of wage plus benefits to be paid

SUPPLEMENTAL BENEFITS
Per hour:

Journeyman	$ 38.50

OVERTIME PAY

Cement Mason	See (B, E, Q, W)
All Others	See (B, E, Q,)

HOLIDAY

Paid:	See (5, 6, 16, 25) on HOLIDAY PAGE
Overtime:	See (5, 6, 16, 25) on HOLIDAY PAGE

- Whenever any of the above holidays fall on Sunday, they will be observed on Monday. Whenever any of the above holidays fall on Saturday, they will be observed on Friday.
- Supplemental Benefits are not paid for paid Holiday
- If Holiday is worked, Supplemental Benefits are paid for hours worked.
- Whenever an Employee works within three (3) calendar days before a holiday, the Employee shall be paid for the Holiday.

REGISTERED APPRENTICES
Wages per hour:

750 hour terms at the following percentage of Journeyman's wage

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Supplemental Benefits per hour

750 hour terms at the following percentage of journeyman supplements

1st	2nd	3rd	4th	5th	6th	7th	8th
50%	55%	60%	65%	70%	75%	80%	85%

Apprentices indentured before June 1st, 2011 receive full journeyman benefits

11-5WP-H/H

Operating Engineer - Building — 08/01/2024

JOB DESCRIPTION Operating Engineer - Building **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, New York, Putnam, Queens, Richmond, Westchester

PARTIAL COUNTIES
Dutchess: that part of Dutchess County lying south of the North City Line of the City of Poughkeepsie.

WAGES
NOTE: Construction surveying
Party Chief--One who directs a survey party
Instrument Man--One who runs the instrument and assists Party Chief.
Rodman--One who holds the rod and assists the Survey Crew

Wages:(Per Hour)	07/01/2024
Building Construction:	
Party Chief	$ 79.99
Instrument Man	60.36
Rodman	40.45
Steel Erection:	
Party Chief	83.13
Instrument Man	64.21
Rodman	44.33

Heavy Construction-NYC counties only:
(Foundation, Excavation.)

Party Chief	88.06
Instrument man	65.66
Rodman	55.70

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2024
Building Construction	$ 28.63* +$ 7.65
Steel Erection	29.23* + 7.65
Heavy Construction	30.04* + 7.64

* This portion subject to SAME premium as wages

Non-Worked Holiday Supplemental Benefit:
21.83

OVERTIME PAY
See (A, B, E, Q) on OVERTIME PAGE
Code "A" applies to Building Construction and has double the rate after 7 hours on Saturdays.
Code "B" applies to Heavy Construction and Steel Erection and had double the rate after 8 hours on Saturdays.

HOLIDAY

Paid:	See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE
Overtime:	See (5, 6, 9, 11, 15, 16, 25) on HOLIDAY PAGE

9-15Db

Operating Engineer - Building — 08/01/2024

JOB DESCRIPTION Operating Engineer - Building **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

PARTIAL COUNTIES
Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES
GROUP I:
Cranes (All Types up to 49 tons), Boom Trucks, Cherry Pickers (All Types), Clamshell Crane, Derrick (Stone and Steel), Dragline, Franki Pile Rig or similar, High Lift (Lull or similar) with crane attachment and winch used for hoisting or lifting, Hydraulic Cranes, Pile Drivers, Potain and similar.

Cranes (All types 50-99 tons), Drill Rig Casa Grande (CAT or similar), Franki Pile Rig or similar, Hydraulic Cranes (All types including Crawler Cranes- No specific boom length).

Cranes (All types 100 tons and over), All Tower Cranes, All Climbing Cranes irrespective of manufacturer and regardless of how the same is rigged, Franki Pile Rig or similar, Conventional Cranes (All types including Crawler Cranes-No specific boom length), Hydraulic Cranes.

GROUP I-A: Barber Green Loader-Euclid Loader, Bulldozer, Carrier-Trailer Horse, Concrete Cleaning Decontamination Machine Operator, Concrete-Portable Hoist, Conway or Similar Mucking Machines, Elevator & Cage, Excavators all types, Front End Loaders, Gradall, Shovel, Backhoe, etc.(Crawler or Truck), Heavy Equipment Robotics Operator/Mechanic, Hoist Engineer-Material, Hoist Portable Mobile Unit, Hoist(Single, Double or Triple Drum), Horizontal Directional Drill Locator, Horizontal Directional Drill Operator and Jersey Spreader, Letourneau or Tournapull(Scrapers over 20 yards Struck), Lift Slab Console, etc., Lull HiLift or Similar, Master Environmental Maintenance Mechanics, Mucking Machines Operator/Mechanic or Similar Type, Overhead Crane, Pavement Breaker(Air Ram), Paver(Concrete), Post Hole Digger, Power House Plant, Road Boring Machine, Road Mix Machine, Ross Carrier and Similar Machines, Rubber tire double end backhoes and similar machines, Scoopmobile Tractor-Shovel Over 1.5 yards, Shovel (Tunnels), Spreader (Asphalt) Telephie(Cableway), Tractor Type Demolition Equipment, Trenching Machines-Vermeer Concrete Saw Trencher and Similar, Ultra High Pressure Waterjet Cutting Tool System, Vacuum Blasting Machine operator/mechanic, Winch Truck A Frame.

GROUP I-B: Compressor (Steel Erection), Mechanic (Outside All Types), Negative Air Machine (Asbestos Removal), Push Button (Buzz Box) Elevator.

GROUP II: Compactor Self-Propelled, Concrete Pump, Crane Operator in Training (Over 100 Tons), Grader, Machines Pulling Sheep's Foot Roller, Roller (4 ton and over), Scrapers (20 yards Struck and Under), Vibratory Rollers, Welder.

GROUP III-A: Asphalt Plant, Concrete Mixing Plants, Forklift (All power sources), Joy Drill or similar, Tractor Drilling Machine, Loader (1 1/2 yards and under), Portable Asphalt Plant, Portable Batch Plant, Portable Crusher, Skid Steer (Bobcat or similar), Stone Crusher, Well Drilling Machine, Well Point System.

GROUP III-B: Compressor Over 125 cu. Feet, Conveyor Belt Machine regardless of size, Compressor Plant, Ladder Hoist, Stud Machine.

GROUP IV-A: Batch Plant, Concrete Breaker, Concrete Spreader, Curb Cutter Machine, Finishing Machine-Concrete, Fine Grading Machine, Hepa Vac Clean Air Machine, Material Hopper(sand, stone, cement), Mulching Grass Spreader, Pump Gypsum etc, Pump-Plaster-Grout-Fireproofing. Roller(Under 4 Ton),Spreading and Fine Grading Machine, Steel Cutting Machine, Siphon Pump, Tar Joint Machine, Television Cameras for Water, Sewer, Gas etc. Turbo Jet Burner or Similar Equipment, Vibrator (1 to 5).

GROUP IV-B: Compressor (all types), Heater (All Types), Fire Watchman, Lighting Unit (Portable & Generator) Pump, Pump Station(Water, Sewer, Portable, Temporary), Welding Machine (Steel Erection & Excavation).

GROUP V: Mechanics Helper, Motorized Roller (walk behind), Stock Attendant, Welder's Helper, Maintenance Engineer Crane(75 ton and over).

Group VI-A: Welder Certified
GROUP VI-B: Utility Man, Warehouse Man.

WAGES: (per hour)

	07/01/2024
GROUP I	
Cranes- up to 49 tons	$ 67.43
Cranes- 50 tons to 99 tons	69.77
Cranes- 100 tons and over	79.64
GROUP I-A	59.04
GROUP I-B	54.41
GROUP II	56.97
GROUP III-A	54.88
GROUP III-B	52.25
GROUP IV-A	54.33
GROUP IV-B	45.94
GROUP V	49.53
Group VI-A	57.96
GROUP VI-B	
Utility Man	47.00
Warehouse Man	49.26

An additional 20% to wage when required to wear protective equipment on hazardous/toxic waste projects.
Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional $2.00 per hour.
Engineers operating cranes with booms 149 feet or over in length will be paid an additional $3.00 per hour.
Loader operators over 5 cubic yard capacity additional .50 per hour.
Shovel operators over 4 cubic yard capacity additional $1.00 per hour.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 32.32

OVERTIME PAY
See (B, E, Q, V) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE

8-137B

Operating Engineer - Heavy&Highway 08/01/2024

JOB DESCRIPTION Operating Engineer - Heavy&Highway **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

PARTIAL COUNTIES
Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES

GROUP I: Boom Truck, Cherry Picker, Clamshell, Crane, (Crawler, Truck),
Dragline, Drill Rig (Casa Grande, Cat, or Similar), Floating Crane (Crane on Barges) under 100 tons, Gin Pole, Hoist Engineer-Concrete (Crane-Derrick-Mine Hoist), Knuckle Boom Crane, Rough Terrain Crane.

GROUP I-A: Auger (Truck or Truck Mounted), Boat Captain, Bulldozer-All Sizes, Central Mix Plant Operator, Chipper (all types), Close Circuit T.V., Combination Loader/Backhoe, Compactor with Blade, Concrete Finishing Machine, Gradall, Grader (Motor Grader), Elevator & Cage (Materials or Passenger), Excavator (and all attachments), Front End Loaders (1 1/2 yards and over), High Lift Lull and similar, Hoist (Single, Double, Triple Drum), Hoist Portable Mobile Unit, Hoist Engineer (Material), Jack and Bore Machine, Log Skidders, Mill Machines, Mucking Machines, Overhead Crane, Paver (concrete), Post Pounder (of any type), Push Cats, Road Reclaimer, Robot Hammer (Brokk or similar), Robotic Equipment (Scope of Engineer Schedule), Ross Carrier and similar, Scrapers (20 yard struck and over), Side Boom, Slip Form Machine, Spreader (Asphalt), Trenching Machines (Telephies-Vermeer Concrete Saw), Tractor Type Demolition Equipment, Vacuum Truck. Vibratory Roller(Riding) or Roller used in mainline paving operations.

GROUP I-B: Asphalt Mobile Conveyor/Transfer Machine, Road Paver (Asphalt).

GROUP II-A: Ballast Regulators, Compactor Self Propelled, Fusion Machine, Rail Anchor Machines, Roller (4 ton and over), Scrapers (20 yard struck and under).

GROUP II-B: Mechanic (Outside) All Types, Shop Mechanic.

GROUP III: Air Tractor Drill, Asphalt Plant, Batch Plant, Boiler (High Pressure), Concrete Breaker (Track or Rubber Tire), Concrete Pump, Concrete Spreader, Excavator Drill, Farm Tractor, Forklift (all types), Gas Tapping (Live), Hydroseeder, Loader (1 1/2 yards and under), Locomotive (all sizes), Machine Pulling Sheeps Foot Roller, Portable Asphalt Plant, Portable Batch Plant, Portable Crusher (Apprentice), Powerhouse Plant, Roller (under 4 ton), Sheer Excavator, Skid Steer/Bobcat, Stone Crusher, Sweeper (with seat), Well Drilling Machine.

GROUP IV: Service Person (Grease Truck), Deckhand.

GROUP IV-B: Conveyor Belt Machine (Truck Mounted), Heater (all types), Lighting Unit (Portable), Maintenance Engineer (For Crane Only), Mechanics Helper, Pump (Fireproofing), Pumps-Pump Station/Water/Sewer/Gypsum/Plaster, etc., Pump Truck (Sewer Jet or Similar), Welders Helper, Welding Machine (Steel Erection), Well Point System.

GROUP V: All Tower Cranes-All Climbing Cranes and all cranes of 100-ton capacity or greater (3900 Manitowac or similar) irrespective of manufacturer and regardless of how the same is rigged, Hoist Engineer (Steel), Engineer-Pile Driver, Jersey Spreader, Pavement Breaker/Post Hole Digger.

WAGES: Per hour:	07/01/2024
Group I	$ 68.63
Group I-A	60.42
Group I-B	63.70
Group II-A	57.84
Group II-B	59.67
Group III	56.81
Group IV	51.57
Group IV-B	44.19
Group V	
Engineer All Tower, Climbing and Cranes of 100 Tons	77.82
Hoist Engineer(Steel)	70.41
Engineer(Pile Driver)	75.13
Jersey Spreader, Pavement Breaker (Air Ram)Post Hole Digger	59.19

Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional $2.00 per hour over the rate listed in the Wage Schedule. Engineers operating cranes with booms 149 feet or over in length will be paid an additional $3.00 per hour over the rate listed in the Wage Schedule. Loader and Excavator Operators: over 5 cubic yards capacity $0.50 per hour over the rate listed in the Wage Schedule. Shovel Operators: over 4 cubic yards capacity $1.00 per hour over the rate listed in the Wage Schedule.

SHIFT WORK

A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts on all government mandated off-shift work

SUPPLEMENTAL BENEFITS

Per hour:

Journeyworker:	$ 34.85 up to 40 Hours
	After 40 hours $ 25.55* PLUS

$ 1.25 on all hours worked

*This amount is subject to premium

OVERTIME PAY
See (B, E, P, *R, **U) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
Overtime..... See (5, 6, 8, 15, 25, 26) on OVERTIME PAGE

* For Holiday codes 8,15,25,26 code R applies
** For Holiday Codes 5 & 6 code U applies

Note: If employees are required to work on Easter Sunday they shall be paid at the rate of triple time.

REGISTERED APPRENTICES
(1)year terms at the following rate.

1st term	$ 30.21
2nd term	36.25
3rd term	42.30
4th term	48.34
Supplemental Benefits per hour:	
	26.85

8-137HH

Operating Engineer - Heavy&Highway — 08/01/2024

JOB DESCRIPTION Operating Engineer - Heavy&Highway **DISTRICT** 9

ENTIRE COUNTIES
Putnam, Westchester

PARTIAL COUNTIES
Dutchess: South of the North city line of Poughkeepsie

WAGES
Party Chief - One who directs a survey party
Instrument Man - One who runs the instrument and assists Party Chief
Rodman - One who holds the rod and in general, assists the Survey Crew
Categories cover GPS & Underground Surveying

Per Hour:	07/01/2024
Party Chief	$ 84.94
Instrument Man	63.15
Rodman	53.43

SUPPLEMENTAL BENEFITS

Per Hour:	07/01/2024
All Categories	
Straight Time:	$ 30.04* + $7.64
Premium:	
Time & 1/2	$ 45.06* + $7.64
Double Time	$ 60.08* + $7.64

Non-Worked Holiday Supplemental Benefits:
$ 21.83

OVERTIME PAY
See (B, *E, Q) on OVERTIME PAGE
* Doubletime paid on all hours in excess of 8 hours on Saturday

HOLIDAY
Paid: See (5, 6, 7, 11, 12) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 12) on HOLIDAY PAGE

9-15Dh

Operating Engineer - Heavy&Highway - Tunnel 08/01/2024

JOB DESCRIPTION Operating Engineer - Heavy&Highway - Tunnel **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

PARTIAL COUNTIES
Dutchess: All the counties of Westchester and Putnam and the southern part of Dutchess County defined by the northern boundary line of the City of Poughkeepsie, then due east to Route 115, then north along Route 115 to Bedell Road, then east along Bedell Road to Van Wagner Road, then north along Van Wagner Road to Bower Road, then east along Bower Road to Route 44 and along Route 44 east to Route 343, then along Route 343 east to the northern boundary of Town of Dover Plains and east along the northern boundary of Town of Dover Plains to the border line of the State of Connecticut and bordered on the west by the middle of the Hudson River.

WAGES
GROUP I: Boom Truck, Cherry Picker, Clamshell, Crane(Crawler, Truck), Dragline, Drill Rig Casa Grande(Cat or Similar), Floating Crane(Crane on Barge-Under 100 Tons), Hoist Engineer(Concrete/Crane-Derrick-Mine Hoist), Knuckle Boom Crane, Rough Terrain Crane.

GROUP I-A: Auger(Truck or Truck Mounted), Boat Captain, Bull Dozer-all sizes, Central Mix Plant Operator, Chipper-all types, Close Circuit T.V., Combination Loader/Backhoe, Compactor with Blade, Concrete Finishing Machine, Gradall, Grader(Motor Grader), Elevator & Cage(Materials or Passengers), Excavator(and all attachments), Front End Loaders(1 1/2 yards and over), High Lift Lull, Hoist(Single, Double, Triple Drum), Hoist Portable Mobile Unit, Hoist Engineer(Material), Jack and Bore Machine, Log Skidder, Milling Machine, Moveable Concrete Barrier Transfer & Transport Vehicle, Mucking Machines. Overhead Crane, Paver(Concrete), Post Pounder of any type, Push Cats, Road Reclaimer, Robot Hammer(Brokk or similar), Robotic Equipment(Scope of Engineer Schedule), Ross Carrier and similar machines, Scrapers(20 yards struck and over), Side Boom, Slip Form Machine, Spreader(Asphalt), Trenching Machines, Telephies-Vermeer Concrete Saw, Tractor type demolition equipment, Vacuum Truck, Vibratory Roller (Riding) used in mainline paving operations.

GROUP I-B: Asphalt Mobile Conveyor/Transfer Machine, Road Paver(Asphalt).

GROUP II-A: Ballast Regulators, Compactor(Self-propelled), Fusion Machine, Rail Anchor Machines, Roller(4 ton and over), Scrapers(20 yard struck and under).

GROUP II-B: Mechanic(outside)all types, Shop Mechanic.

GROUP III: Air Tractor Drill, Asphalt Plant, Batch Plant, Boiler(High Pressure), Concrete Breaker(Track or Rubber Tire), Concrete Pump, Concrete Spreader, Excavator Drill, Farm Tractor, Forklift(all types of power), Gas Tapping(Live), Hydroseeder, Loader(1 1/2 yards and under), Locomotive(all sizes), Machine Pulling Sheeps Foot Roller, Portable Asphalt Plant, Portable Batch Plant, Portable Crusher(Apprentice), Powerhouse Plant, Roller(under 4 ton), Sheer Excavator, Skidsteer/Bobcat, Stone Crusher, Sweeper(with seat), Well Drilling Machine.

GROUP IV-A: Service Person(Grease Truck), Deckhand.

GROUP IV-B: Conveyor Belt Machine(Truck Mounted), Heater(all types), Lighting Unit(Portable), Maintenance Engineer(for Crane only), Mechanics Helper, Pump(Fireproofing), Pumps-Pump Station/Water/Sewer/Gypsum/Plaster, etc., Pump Truck(Sewer Jet or similar), Welding Machine(Steel Erection), Welders Helper.

GROUP V-A: Engineer(all Tower Cranes, all Climbing Cranes & all Cranes of 100 ton capacity or greater),Hoist Engineer(Steel-Sub Structure), Engineer-Pile Driver, Jersey-Spreader, Pavement breaker, Post Hole Digger

WAGES: (per hour)

	07/01/2024
GROUP I	$ 68.63
GROUP I-A	60.42
GROUP I-B	63.70
GROUP II-A	57.84
GROUP II-B	59.67
GROUP III	56.81
GROUP IV-A	51.57
GROUP IV-B	44.19
GROUP V-A	
Engineer-Cranes	77.82
Engineer-Pile Driver	75.13
Hoist Engineer	70.41
Jersey Spreader/Post Hole Digger	59.19

An additional 20% to wage when required to wear protective equipment on hazardous/toxic waste projects. Operators required to use two buckets pouring concrete on other than road pavement shall receive $0.50 per hour over scale. Engineers operating cranes with booms 100 feet but less than 149 feet in length will be paid an additional $2.00 per hour. Engineers operating cranes with booms 149 feet or over in length will be paid an additional $3.00 per hour. Operators of shovels with a capacity over (4) cubic yards shall be paid an additional $1.00 per hour. Operators of loaders with a capacity over (5) cubic yards shall be paid an additional $0.50 per hour.

SHIFT WORK
A 15% premium on all hours paid, including overtime hours for 2nd, 3rd shifts
on all government mandated off-shift work

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker:

$ 34.85 up to 40 hours
After 40 hours $25.55 plus $1.25 on all hours worked

OVERTIME PAY
See (D, O, *U, V) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 25, 26) on HOLIDAY PAGE
* Note: For Holiday codes 5 & 6, code U applies. For Holiday codes 8, 15, 25, 26, code R applies.
Note: If employees are required to work on Easter Sunday, they shall be paid at the rate of triple time.

REGISTERED APPRENTICES
(1)year terms at the following rates:

1st term	$ 30.21
2nd term	36.25
3rd term	42.30
4th term	48.34

Supplemental Benefits per hour:

All terms	$ 26.85

8-137Tun

Operating Engineer - Marine Dredging — 08/01/2024

JOB DESCRIPTION Operating Engineer - Marine Dredging **DISTRICT** 4

ENTIRE COUNTIES
Albany, Bronx, Cayuga, Clinton, Columbia, Dutchess, Essex, Franklin, Greene, Jefferson, Kings, Monroe, Nassau, New York, Orange, Oswego, Putnam, Queens, Rensselaer, Richmond, Rockland, St. Lawrence, Suffolk, Ulster, Washington, Wayne, Westchester

WAGES
These wages do not apply to Operating Engineers on land based construction projects. For those projects, please see the Operating Engineer Heavy/Highway Rates. The wage rates below for all equipment and operators are only for marine dredging work in navigable waters found in the counties listed above.

Per Hour:	07/01/2024
CLASS A1 Deck Captain, Leverman, Mechanical Dredge Operator, Licensed Tug Operator 1000HP or more.	$ 45.26
CLASS A2 Crane Operator (360 swing)	40.33
CLASS B Dozer, Front Loader Operator on Land	To conform to Operating Engineer Prevailing Wage in locality where work is being performed including benefits.
CLASS B1 Derrick Operator (180 swing) Spider/Spill Barge Operator	39.14

Operator II, Fill Placer, Engineer
Chief Mate, Electrician,Chief Welder,
Maintenance Engineer,Licensed Boat, Crew Boat Operator

CLASS B2 36.84
Certified Welder

CLASS C1 35.83
Drag Barge Operator,
Steward, Mate,
Assistant Fill Placer

CLASS C2 34.68
Boat Operator

CLASS D 28.81
Shoreman, Deckhand, Oiler,
Rodman, Scowman, Cook,
Messman, Porter/Janitor

SUPPLEMENTAL BENEFITS
Per Hour:
THE FOLLOWING SUPPLEMENTAL BENEFITS APPLY TO ALL CATEGORIES

All Classes A & B $ 12.00 plus 7% of straight time wage, Overtime hours add $ 0.63

All Class C & D $ 11.75 plus 7% of straight time wage, Overtime hours add $ 0.50

OVERTIME PAY
See (B2, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 26) on HOLIDAY PAGE

4-25a-MarDredge

Operating Engineer - Survey Crew - Consulting Engineer 08/01/2024

JOB DESCRIPTION Operating Engineer - Survey Crew - Consulting Engineer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

PARTIAL COUNTIES
Dutchess: That part in Duchess County lying South of the North City line of Poughkeepsie.

WAGES
Feasibility and preliminary design surveying, any line and grade surveying for inspection or supervision of construction.

Per hour: 07/01/2024
Survey Classifications

Party Chief $ 49.39
Instrument Man 40.96
Rodman 35.63

SUPPLEMENTAL BENEFITS
Per Hour:

All Crew Members: $ 23.75

OVERTIME PAY
OVERTIME:.... See (B, E*, Q, V) ON OVERTIME PAGE.
*Double-time paid on the 9th hour on Saturday.

HOLIDAY
Paid: See (5, 6, 7, 11, 16) on HOLIDAY PAGE
Overtime: See (5, 6, 7, 11, 16) on HOLIDAY PAGE

Painter **08/01/2024**

JOB DESCRIPTION Painter **DISTRICT** 8

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Putnam, Queens, Richmond, Suffolk, Westchester

WAGES

Per hour:	07/01/2024	05/01/2025 Additional
Brush	52.86*	$ 2.62**
Abatement/Removal of lead based or lead containing paint on materials to be repainted.	52.86*	
Spray & Scaffold	$ 55.86*	
Fire Escape	55.86*	
Decorator	55.86*	
Paperhanger/Wall Coverer	55.09*	

*Subtract $ 0.10 to calculate premium rate.

** To be allocated at a later date.

SUPPLEMENTAL BENEFITS
Per hour:

Paperhanger	$ 36.73
All others	34.31
Premium	38.28**

**Applies only to "All others" category, not paperhanger journeyworker.

OVERTIME PAY
See (A, E, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
One (1) year terms at the following wage rate.

Per hour:	07/01/2024
Appr 1st term...	$ 20.22*
Appr 2nd term...	25.93*
Appr 3rd term...	31.61*
Appr 4th term...	42.40*

*Subtract $ 0.10 to calculate premium rate.

Supplemental benefits:
Per Hour:

Appr 1st term...	$ 16.89
Appr 2nd term...	20.95
Appr 3rd term...	24.10
Appr 4th term...	30.57

8-NYDC9-B/S

Painter **08/01/2024**

JOB DESCRIPTION Painter **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Suffolk, Westchester

PARTIAL COUNTIES

Nassau: All of Nassau except the areas described below: Atlantic Beach, Ceaderhurst, East Rockaway, Gibson, Hewlett, Hewlett Bay, Hewlett Neck, Hewlett Park, Inwood, Lawrence, Lido Beach, Long Beach, parts of Lynbrook, parts of Oceanside, parts of Valley Stream, and Woodmere. Starting on the South side of Sunrise Hwy in Valley Stream running east to Windsor and Rockaway Ave., Rockville Centre is the boundary line up to Lawson Blvd. turn right going west all the above territory. Starting at Union Turnpike and Lakeville Rd. going north to Northern Blvd. the west side of Lakeville road to Northern blvd. At Northern blvd. going east the district north of Northern blvd. to Port Washington Blvd. West of Port Washington blvd.to St.Francis Hospital then north of first traffic light to Port Washington and Sands Point, Manor HAven, Harbour Acres.

WAGES

Per hour:	07/01/2024	05/01/2025
Drywall Taper:	$ 52.86*	Additional
Scaffold:	$ 55.86*	$ 2.62**

*Subtract $ 0.10 to calculate premium rate.

** To be allocated a later date.

SUPPLEMENTAL BENEFITS

Per hour:

Journeyman	$ 34.31

OVERTIME PAY

See (A, E, R) on OVERTIME PAGE

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES

Wages - Per Hour:

1500 hour terms at the following wage rate:

1st term	$ 20.22*
2nd term	25.93*
3rd term	31.61*
4th term	42.40*

*Subtract $ 0.10 to calculate premium rate.

Supplemental Benefits - Per hour:
One year term (1500 hours) at the following dollar amount.

1st year	$ 16.89
2nd year	20.95
3rd year	24.10
4th year	30.57

8-NYDCT9-DWT

Painter - Bridge & Structural Steel — 08/01/2024

JOB DESCRIPTION Painter - Bridge & Structural Steel **DISTRICT** 8

ENTIRE COUNTIES

Albany, Bronx, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Kings, Montgomery, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES

Per Hour:
STEEL:

Bridge Painting:	07/01/2024
	$ 56.00
	+ 10.35*

ADDITIONAL $7.00 per hour for POWER TOOL/SPRAY, whether straight time or overtime.

NOTE: All premium wages are to be calculated on base rate per hour only.

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (50 hour cap).

NOTE: Generally, for Bridge Painting Contracts, ALL WORKERS on and off the bridge (including Flagmen) are to be paid Painter's Rate; the contract must be ONLY for Bridge Painting.

SHIFT WORK
When directly specified in public agency or authority contract documents for an employer to work a second shift and works the second shift with employees other than from the first shift, all employees who work the second shift will be paid 10% of the base wage shift differential in lieu of overtime for the first eight (8) hours worked after which the employees shall be paid at time and one half of the regular wage rate. When a single irregular work shift is mandated in the job specifications or by the contracting agency, wages shall be paid at time and one half for single shifts between the hours of 3pm-11pm or 11pm-7am.

SUPPLEMENTAL BENEFITS
Per Hour:
Journeyworker:

$ 12.43
+ 31.55*

* For the period of May 1st to November 15th, this amount is payable up to 40 hours. For the period of Nov 16th to April 30th, this amount is payable up to 50 hours. EXCEPTION: First and last week of employment, and for the weeks of Memorial Day, Independence Day and Labor Day, where the amount is paid for the actual number of hours worked (50 hour cap).

OVERTIME PAY
See (B, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (4, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wage - Per hour:
Apprentices: (1) year terms.

1st year	$ 22.40 + 4.14
2nd year	$ 33.60 + 6.21
3rd year	$ 44.80 + 8.28

Supplemental Benefits - Per hour:

1st year	$ 1.16 + 12.62
2nd year	$ 7.46 + 18.93
3rd year	$ 9.94 + 25.24

NOTE: All premium wages are to be calculated on base rate per hour only.

8-DC-9/806/155-BrSS

Painter - Line Striping — 08/01/2024

JOB DESCRIPTION Painter - Line Striping **DISTRICT** 8

ENTIRE COUNTIES
Albany, Clinton, Columbia, Dutchess, Essex, Franklin, Fulton, Greene, Hamilton, Montgomery, Nassau, Orange, Putnam, Rensselaer, Rockland, Saratoga, Schenectady, Schoharie, Suffolk, Sullivan, Ulster, Warren, Washington, Westchester

WAGES
Per hour:

Painter (Striping-Highway):	07/01/2024	04/01/2025	04/01/2026
Striping-Machine Operator*	$ 34.12	$ 35.49	$ 36.93
Linerman Thermoplastic	41.12	42.74	44.44

Note: * Includes but is not limited to: Positioning of cones and directing of traffic using hand held devices. Excludes the Driver/Operator of equipment used in the maintenance and protection of traffic safety.

SHIFT WORK
When directly specified in public agency or authority contract documents there shall be a 30% night shift premium pay differential for all work performed after 9:00pm and before 5:00am.

SUPPLEMENTAL BENEFITS
Per hour paid:
Journeyworker:

Striping Machine Operator:	$23.65	$ 24.30	$ 24.95
Linerman Thermoplastic:	23.65	24.30	24.95

OVERTIME PAY
See (B, B2, E2, F, S) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 20) on HOLIDAY PAGE
Overtime: See (5, 20) on HOLIDAY PAGE

REGISTERED APPRENTICES
One (1) year terms at the following wage rates:

1st Term:	$ 16.00	$ 16.00	$ 16.00
2nd Term:	20.47	21.29	22.16
3rd Term:	27.30	28.39	29.54

Supplemental Benefits per hour:

All terms:	$ 23.65	$ 24.30	$ 24.95

8-1456-LS

Painter - Metal Polisher — 08/01/2024

JOB DESCRIPTION Painter - Metal Polisher **DISTRICT** 8

ENTIRE COUNTIES
Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES

	07/01/2024
Metal Polisher	$ 39.33
Metal Polisher*	40.43
Metal Polisher**	43.33

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

SUPPLEMENTAL BENEFITS
Per Hour: 07/01/2024

Journeyworker:
All classification $ 12.79

OVERTIME PAY
See (B, E, P, T) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE
Overtime: See (5, 6, 11, 15, 16, 25, 26) on HOLIDAY PAGE

REGISTERED APPRENTICES
Wages per hour:
One (1) year term at the following wage rates:

	07/01/2024
1st year	$ 19.67
2nd year	21.63
3rd year	23.60
1st year*	$ 22.06

2nd year*	22.07
3rd year*	24.14
1st year**	$ 22.17
2nd year**	24.13
3rd year**	26.10

*Note: Applies on New Construction & complete renovation
** Note: Applies when working on scaffolds over 34 feet.

Supplemental benefits:
Per hour:

1st year	$ 8.69
2nd year	8.69
3rd year	8.69

8-8A/28A-MP

Plumber — 08/01/2024

JOB DESCRIPTION Plumber **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

WAGES
Per hour:

	07/01/2024
Plumber and Steamfitter	$ 63.76

SHIFT WORK
SHIFT WORK:
When directly specified in public agency or authority contract documents, shift work outside the regular hours of work shall be comprised of eight (8) hours per shift not including Saturday, Sundays and holidays. One half (1/2) hour shall be allowed for lunch after the first four (4) hours of each shift. Wage and Fringes for shift work shall be straight time plus a shift premium of twenty-five (25%) percent. A minimum of five days Monday through Friday must be worked to establish shift work.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker	$ 43.61

OVERTIME PAY
See (B, E, E2, Q, V) on OVERTIME PAGE
OVERTIME:... See on OVERTIME PAGE.

HOLIDAY

Paid:	See (1) on HOLIDAY PAGE
Overtime:	See (5, 6, 8, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1)year terms at the following wages:

1st Term	$ 23.75
2nd Term	27.23
3rd Term	31.47
4th Term	44.80
5th Term	48.05

Supplemental Benefits per hour:

1st term	$ 17.94
2nd term	20.05
3rd term	23.82
4th term	31.51
5th term	33.42

8-21.1-ST

Plumber - HVAC / Service — 08/01/2024

JOB DESCRIPTION Plumber - HVAC / Service **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Putnam, Westchester

PARTIAL COUNTIES
Delaware: Only the townships of Middletown and Roxbury
Ulster: Entire County(including Wallkill and Shawangunk Prisons) except for remainder of Town of Shawangunk and Towns of Plattekill, Marlboro, and Wawarsing.

WAGES

Per hour:	07/01/2024
HVAC Service	$ 43.43
	+ $ 4.47*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SUPPLEMENTAL BENEFITS
Per hour:

Journeyworker HVAC Service
$ 30.39

OVERTIME PAY
See (B, F, R) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
HVAC SERVICE
(1)year terms at the following wages:

1st yr.	2nd yr.	3rd yr.	4th yr.	5th yr.
$ 19.66	$ 23.32	$ 29.05	$ 35.73	$ 38.83
+$2.43*	+$2.76*	+$3.31*	+$3.96*	+$4.21*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits per hour:

Apprentices	07/01/2024
1st term	$ 21.47
2nd term	23.05
3rd term	24.76
4th term	27.13
5th term	28.81

8-21.1&2-SF/Re/AC

Plumber - Jobbing & Alterations — 08/01/2024

JOB DESCRIPTION Plumber - Jobbing & Alterations **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Putnam, Westchester

PARTIAL COUNTIES
Ulster: Entire county (including Wallkill and Shawangunk Prisons in Town of Shawangunk) EXCEPT for remainder of Town of Shawangunk, and Towns of Plattekill, Marlboro, and Wawarsing.

WAGES

Per hour:	07/01/2024
Journeyworker:	$ 49.63

Repairs, replacements and alteration work is any repair or replacement of a present plumbing system that does not change existing roughing or water supply lines.

SHIFT WORK
When directly specified in public agency or authority contract documents, shift work outside the regular hours of work shall be comprised of eight (8) hours per shift not including Saturday, Sundays and holidays. One half (1/2) hour shall be allowed for lunch after the first four (4) hours of each shift. Wage and Fringes for shift work shall be straight time plus a shift premium of twenty-five (25%) percent. A minimum of five days Monday through Friday must be worked to establish shift work.

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker
$ 36.44

OVERTIME PAY
See (B, *E, E2, Q, V) on OVERTIME PAGE
*When used as a make-up day, hours after 8 on Saturday shall be paid at time and one half.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1) year terms at the following wages:

1st year	$ 21.35
2nd year	23.73
3rd year	25.87
4th year	36.28
5th year	38.34

Supplemental Benefits per hour:

1st year	$ 12.11
2nd year	14.21
3rd year	18.38
4th year	24.86
5th year	26.96

8-21.3-J&A

Roofer — 08/01/2024

JOB DESCRIPTION Roofer **DISTRICT** 9

ENTIRE COUNTIES
Bronx, Dutchess, Kings, New York, Orange, Putnam, Queens, Richmond, Rockland, Sullivan, Ulster, Westchester

WAGES
Per Hour: 07/01/2024

Roofer/Waterproofer	$ 48.50
	+ $7.00*

* This portion is not subjected to overtime premiums.

Note: Abatement/Removal of Asbestos containing roofs and roofing material is classified as Roofer.

SUPPLEMENTAL BENEFITS
Per Hour: $ 31.87

OVERTIME PAY
See (B, H) on OVERTIME PAGE
Note: An observed holiday that falls on a Sunday will be observed the following Monday.

HOLIDAY
Overtime: See (5, 6) on HOLIDAY PAGE

REGISTERED APPRENTICES
(1) year term apprentices indentured prior to 01/01/2023

1st	2nd	3rd	4th
$ 16.97	$ 24.25	$ 29.10	$ 36.37
	+ 3.50*	+ 4.20*	+ 5.26*

Supplements:

1st	2nd	3rd	4th
$ 4.10	$ 16.17	$ 19.31	$ 24.02

* This portion is not subjected to overtime premiums.

(1) year term apprentices indentured after 01/01/2023

1st	2nd	3rd	4th	5th
$ 18.43	$ 21.82	$ 24.25	$ 29.10	$ 36.37
	+ 3.16*	+ 3.50*	+ 4.20*	+ 5.26

Supplements:

1st	2nd	3rd	4th	5th
$ 7.73	$ 14.59	$ 16.17	$ 19.31	$ 24.02

* This portion is not subjected to overtime premiums.

9-8R

Sheetmetal Worker — 08/01/2024

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 8

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES

	07/01/2024
SheetMetal Worker	$ 49.51
	+ 3.71*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

SHIFT WORK
For all NYS D.O.T. and other Governmental mandated off-shift work:
10% increase for additional shifts for a minimum of five (5) days

SUPPLEMENTAL BENEFITS
Journeyworker $ 46.20

OVERTIME PAY
OVERTIME:.. See (B, E, Q,) on OVERTIME PAGE.

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 16, 23) on HOLIDAY PAGE

REGISTERED APPRENTICES

1st	2nd	3rd	4th	5th	6th	7th	8th
$ 20.20	$ 20.81	$ 23.12	$ 25.42	$ 27.74	$ 30.08	$ 32.86	$ 35.63
+ 1.48*	+ 1.67*	+ 1.86*	+ 2.04*	+ 2.23*	+ 2.41*	+ 2.60*	+ 2.78*

*This portion of the benefit is NOT subject to the SAME PREMIUM as shown for overtime.

Supplemental Benefits per hour:

Apprentices	
1st term	$ 18.07
2nd term	22.24
3rd term	24.71
4th term	27.21
5th term	29.67
6th term	32.12
7th term	34.12
8th term	36.15

8-38

Sheetmetal Worker — 08/01/2024

JOB DESCRIPTION Sheetmetal Worker **DISTRICT** 4

ENTIRE COUNTIES
Bronx, Kings, Nassau, New York, Queens, Richmond, Rockland, Suffolk, Westchester

WAGES
Per Hour:

Sign Erector $ 58.00

NOTE: Structurally Supported Overhead Highway Signs(See STRUCTURAL IRON WORKER CLASS)

SUPPLEMENTAL BENEFITS
Per Hour: 07/01/2024

Sign Erector $ 57.12

OVERTIME PAY
See (A, F, S) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 10, 11, 12, 16, 25) on HOLIDAY PAGE

REGISTERED APPRENTICES
Per Hour:
6 month Terms at the following percentage of Sign Erectors wage rate:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
35%	40%	45%	50%	55%	60%	65%	70%	75%	80%

SUPPLEMENTAL BENEFITS
Per Hour:

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 16.05	$ 18.21	$ 20.37	$ 22.53	$ 31.17	$ 33.91	$ 37.53	$ 40.34	$ 43.17	$ 45.97

4-137-SE

Sprinkler Fitter — 08/01/2024

JOB DESCRIPTION Sprinkler Fitter **DISTRICT** 1

ENTIRE COUNTIES
Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, Westchester

WAGES
Per hour 07/01/2024

Sprinkler Fitter $ 53.34

SUPPLEMENTAL BENEFITS
Per hour

Journeyworker $ 30.77

OVERTIME PAY
See (B, E, Q) on OVERTIME PAGE

HOLIDAY
Paid: See (1) on HOLIDAY PAGE
Overtime: See (5, 6) on HOLIDAY PAGE
Note: When a holiday falls on Sunday, the following Monday shall be considered a holiday and all work performed on either day shall be at the double time rate. When a holiday falls on Saturday, the preceding Friday shall be considered a holiday and all work performed on either day shall be at the double time rate.

REGISTERED APPRENTICES
Wages per hour

One Half Year terms at the following wage.

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 25.89	$ 28.77	$ 31.39	$ 34.27	$ 37.14	$ 40.02	$ 42.90	$ 45.77	$ 48.65	$ 51.53

Supplemental Benefits per hour

1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
$ 9.18	$ 9.18	$ 20.90	$ 20.90	$ 21.15	$ 21.15	$ 21.15	$ 21.15	$ 21.15	$ 21.15

1-669.2

Teamster - Building / Heavy&Highway — 08/01/2024

JOB DESCRIPTION Teamster - Building / Heavy&Highway **DISTRICT** 8

ENTIRE COUNTIES
Putnam, Westchester

WAGES
GROUP A: Straight Trucks (6-wheeler and 10-wheeler), A-frame, Winch, Dynamite Seeding, Mulching, Agitator, Water, Attenuator, Light Towers, Cement (all types), Suburban, Station Wagons, Cars, Pick Ups, any vehicle carrying materials of any kind.
GROUP AA: Tack Coat
GROUP B: Tractor & Trailers (all types).
GROUP BB: Tri-Axle,14 Wheeler
GROUP C: Low Boy (carrying equipment).

GROUP D: Fuel Trucks, Tire Trucks.
GROUP E: Off-road Equipment (over 40 tons): Athey Wagons, Belly Dumps, Articulated Dumps, Trailer Wagons.
GROUP F: Off-road Equipment (over 40 tons) Euclid, DJB.
GROUP G: Off-road Equipment (under 40 tons) Athey Wagons, Belly Articulated Dumps, Trailer Wagons.
GROUP H: Off-road Equipment(under 40 tons), Euclid.
GROUP HH: Off-road Equipment(under 40 tons) D.J.B.
GROUP I: Off-road Equipment(under 40 tons) Darts.
GROUP II: Off-road Equipment(under 40 tons) RXS.

WAGES:(per hour)

	07/01/2024
GROUP A	$ 47.86*
GROUP AA	50.86*
GROUP B	48.48*
GROUP BB	47.98*
GROUP C	50.61*
GROUP D	48.31*
GROUP E	48.86*
GROUP F	49.86*
GROUP G	48.61*
GROUP H	49.23*
GROUP HH	49.61*
GROUP I	49.36*
GROUP II	49.73*

* To calculate premium wage, subtract $ .10 from the hourly wage.

Note: Fuel truck operators on construction sites addit. $5.00 per day.
For work on hazardous/toxic waste site addit. 20% of hourly rate.

SHIFT WORK
When mandated by the contracting agency, DOT, or any governmental agency contracts shall receive a shift differential of fifteen (15%) above the wage rate.

SUPPLEMENTAL BENEFITS
Per hour:
Journeyworker

First 40 hours	$ 37.33
41st-45th hours	16.73
Over 45 hours	1.60

OVERTIME PAY
See (B, E, P, R) on OVERTIME PAGE

HOLIDAY
Paid: See (5, 6, 8, 15, 25) on HOLIDAY PAGE
Overtime: See (5, 6, 8, 15, 25) on HOLIDAY PAGE

8-456

Welder 08/01/2024

JOB DESCRIPTION Welder **DISTRICT** 1

ENTIRE COUNTIES
Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Erie, Essex, Franklin, Fulton, Genesee, Greene, Hamilton, Herkimer, Jefferson, Kings, Lewis, Livingston, Madison, Monroe, Montgomery, Nassau, New York, Niagara, Oneida, Onondaga, Ontario, Orange, Orleans, Oswego, Otsego, Putnam, Queens, Rensselaer, Richmond, Rockland, Saratoga, Schenectady, Schoharie, Schuyler, Seneca, St. Lawrence, Steuben, Suffolk, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wayne, Westchester, Wyoming, Yates

WAGES
Per hour 07/01/2024

Welder: To be paid the same rate of the mechanic performing the work.*

*EXCEPTION: If a specific welder certification is required, then the 'Certified Welder' rate in that trade tag will be paid.

OVERTIME PAY

HOLIDAY

1-As Per Trade

Overtime Codes

Following is an explanation of the code(s) listed in the OVERTIME section of each classification contained in the attached schedule. Additional requirements may also be listed in the HOLIDAY section.

NOTE: Supplemental Benefits are 'Per hour worked' (for each hour worked) unless otherwise noted

(AA)	Time and one half of the hourly rate after 7 and one half hours per day
(A)	Time and one half of the hourly rate after 7 hours per day
(B)	Time and one half of the hourly rate after 8 hours per day
(B1)	Time and one half of the hourly rate for the 9th & 10th hours week days and the 1st 8 hours on Saturday. Double the hourly rate for all additional hours
(B2)	Time and one half of the hourly rate after 40 hours per week
(C)	Double the hourly rate after 7 hours per day
(C1)	Double the hourly rate after 7 and one half hours per day
(D)	Double the hourly rate after 8 hours per day
(D1)	Double the hourly rate after 9 hours per day
(E)	Time and one half of the hourly rate on Saturday
(E1)	Time and one half 1st 4 hours on Saturday; Double the hourly rate all additional Saturday hours
(E2)	Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
(E3)	Between November 1st and March 3rd Saturday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather, provided a given employee has worked between 16 and 32 hours that week
(E4)	Saturday and Sunday may be used as a make-up day at straight time when a day is lost during that week due to inclement weather
(E5)	Double time after 8 hours on Saturdays
(F)	Time and one half of the hourly rate on Saturday and Sunday
(G)	Time and one half of the hourly rate on Saturday and Holidays
(H)	Time and one half of the hourly rate on Saturday, Sunday, and Holidays
(I)	Time and one half of the hourly rate on Sunday
(J)	Time and one half of the hourly rate on Sunday and Holidays
(K)	Time and one half of the hourly rate on Holidays
(L)	Double the hourly rate on Saturday
(M)	Double the hourly rate on Saturday and Sunday
(N)	Double the hourly rate on Saturday and Holidays
(O)	Double the hourly rate on Saturday, Sunday, and Holidays
(P)	Double the hourly rate on Sunday
(Q)	Double the hourly rate on Sunday and Holidays
(R)	Double the hourly rate on Holidays
(S)	Two and one half times the hourly rate for Holidays

(S1) Two and one half times the hourly rate the first 8 hours on Sunday or Holidays One and one half times the hourly rate all additional hours.

(T) Triple the hourly rate for Holidays

(U) Four times the hourly rate for Holidays

(V) Including benefits at SAME PREMIUM as shown for overtime

(W) Time and one half for benefits on all overtime hours.

(X) Benefits payable on Paid Holiday at straight time. If worked, additional benefit amount will be required for worked hours. (Refer to other codes listed.)

Holiday Codes

PAID Holidays:

Paid Holidays are days for which an eligible employee receives a regular day's pay, but is not required to perform work. If an employee works on a day listed as a paid holiday, this remuneration is in addition to payment of the required prevailing rate for the work actually performed.

OVERTIME Holiday Pay:

Overtime holiday pay is the premium pay that is required for work performed on specified holidays. It is only required where the employee actually performs work on such holidays. The applicable holidays are listed under HOLIDAYS: OVERTIME. The required rate of pay for these covered holidays can be found in the OVERTIME PAY section listings for each classification.

Following is an explanation of the code(s) listed in the HOLIDAY section of each classification contained in the attached schedule. The Holidays as listed below are to be paid at the wage rates at which the employee is normally classified.

(1)	None
(2)	Labor Day
(3)	Memorial Day and Labor Day
(4)	Memorial Day and July 4th
(5)	Memorial Day, July 4th, and Labor Day
(6)	New Year's, Thanksgiving, and Christmas
(7)	Lincoln's Birthday, Washington's Birthday, and Veterans Day
(8)	Good Friday
(9)	Lincoln's Birthday
(10)	Washington's Birthday
(11)	Columbus Day
(12)	Election Day
(13)	Presidential Election Day
(14)	1/2 Day on Presidential Election Day
(15)	Veterans Day
(16)	Day after Thanksgiving
(17)	July 4th
(18)	1/2 Day before Christmas
(19)	1/2 Day before New Years
(20)	Thanksgiving
(21)	New Year's Day
(22)	Christmas
(23)	Day before Christmas
(24)	Day before New Year's
(25)	Presidents' Day
(26)	Martin Luther King, Jr. Day
(27)	Memorial Day
(28)	Easter Sunday

(29) Juneteenth

New York State Department of Labor - Bureau of Public Work
State Office Building Campus
Building 12 - Room 130
Albany, New York 12226

REQUEST FOR WAGE AND SUPPLEMENT INFORMATION

As Required by Articles 8 and 9 of the NYS Labor Law

Fax (518) 485-1870 or mail this form for new schedules or for determination for additional occupations.

This Form Must Be Typed

Submitted By: (Check Only One) ☐ Contracting Agency ☐ Architect or Engineering Firm ☐ Public Work District Office Date:

A. Public Work Contract to be let by: (Enter Data Pertaining to Contracting/Public Agency)

1. Name and complete address ☐ (Check if new or change)

Telephone Fax

E-Mail:

2. NY State Units (see Item 5).

- ☐ 01 DOT
- ☐ 02 OGS
- ☐ 03 Dormitory Authority
- ☐ 04 State University Construction Fund
- ☐ 05 Mental Hygiene Facilities Corp.
- ☐ 06 OTHER N.Y. STATE UNIT
- ☐ 07 City
- ☐ 08 Local School District
- ☐ 09 Special Local District, i.e., Fire, Sewer, Water District
- ☐ 1O Village
- ☐ 11 Town
- ☐ 12 County
- ☐ 13 Other Non-N.Y. State (Describe)

3. SEND REPLY TO ☐ (check if new or change)
Name and complete address:

Telephone Fax

E-Mail:

4. SERVICE REQUIRED. Check appropriate box and provide project information.

☐ New Schedule of Wages and Supplements.

APPROXIMATE BID DATE :

☐ Additional Occupation and/or Redetermination

PRC NUMBER ISSUED PREVIOUSLY FOR THIS PROJECT :

OFFICE USE ONLY

B. PROJECT PARTICULARS

5. Project Title _____

Description of Work _____

_____

Contract Identification Number _____

Note: For NYS units, the OSC Contract No. _____

6. Location of Project:
Location on Site _____

Route No/Street Address _____

Village or City _____

Town _____

County _____

7. Nature of Project - Check One:

- ☐ 1. New Building
- ☐ 2. Addition to Existing Structure
- ☐ 3. Heavy and Highway Construction (New and Repair)
- ☐ 4. New Sewer or Waterline
- ☐ 5. Other New Construction (Explain)
- ☐ 6. Other Reconstruction, Maintenance, Repair or Alteration
- ☐ 7. Demolition
- ☐ 8. Building Service Contract

8. OCCUPATION FOR PROJECT :

- ☐ Construction (Building, Heavy Highway/Sewer/Water)
- ☐ Tunnel
- ☐ Residential
- ☐ Landscape Maintenance
- ☐ Elevator maintenance
- ☐ Exterminators, Fumigators
- ☐ Fire Safety Director, NYC Only
- ☐ Fuel Delivery
- ☐ Guards, Watchmen
- ☐ Janitors, Porters, Cleaners, Elevator Operators
- ☐ Moving furniture and equipment
- ☐ Trash and refuse removal
- ☐ Window cleaners
- ☐ Other (Describe)

9. Does this project comply with the Wicks Law involving separate bidding? YES ☐ NO ☐

10. Name and Title of Requester

Signature

SEE PAGE TWO FOR LAWS RELATING TO PUBLIC WORK CONTRACTS

NEW YORK STATE DEPARTMENT OF LABOR
Bureau of Public Work - Debarment List

LIST OF EMPLOYERS INELIGIBLE TO BID ON OR BE AWARDED ANY PUBLIC WORK CONTRACT

Under Article 8 and Article 9 of the NYS Labor Law, a contractor, sub-contractor and/or its successor shall be debarred and ineligible to submit a bid on or be awarded any public work or public building service contract/sub-contract with the state, any municipal corporation or public body for a period of five (5) years from the date of debarment when:

- Two (2) final determinations have been rendered within any consecutive six-year (6) period determining that such contractor, sub-contractor and/or its successor has WILLFULLY failed to pay the prevailing wage and/or supplements;
- One (1) final determination involves falsification of payroll records or the kickback of wages and/or supplements.

The agency issuing the determination and providing the information, is denoted under the heading 'Fiscal Officer'. DOL = New York State Department of Labor; NYC = New York City Comptroller's Office; AG = New York State Attorney General's Office; DA = County District Attorney's Office.

Debarment Database: To search for contractors, sub-contractors and/or their successors debarred from bidding or being awarded any public work contract or subcontract under NYS Labor Law Articles 8 and 9, or under NYS Workers' Compensation Law Section 141-b, access the database at this link: https://apps.labor.ny.gov/EDList/searchPage.do

For inquiries please call 518-457-5589.

NYSDOL Bureau of Public Work Debarment List 08/09/2024

Article 8

AGENCY	Fiscal Officer	FEIN	EMPLOYER NAME	EMPLOYER DBA NAME	ADDRESS	DEBARMENT START DATE	DEBARMENT END DATE
DOL	DOL	*****5754	0369 CONTRACTORS, LLC		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL	*****5784	A.J.M. TRUCKING, INC.		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	AG	*****1812	ADVANCED BUILDERS & LAND DEVELOPMENT, INC.		400 OSER AVE #2300HAUPPAUGE NY 11788	09/11/2019	09/11/2024
DOL	NYC		ALL COUNTY SEWER & DRAIN, INC.		7 GREENFIELD DR WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL	*****8387	AMERICAN PAVING & MASONRY, CORP.		8 FOREST AVE GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL	*****8654	AMERICAN PAVING, INC.		8 FORREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	NYC		AMJED PARVEZ		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DOL		ANGELO F COKER		2610 SOUTH SALINA STREET SUITE 14SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL		ANGELO GARCIA		515 WEST AVE UNIT PH 13NORWALK CT 06850	05/12/2021	05/12/2026
DOL	DOL		ANGELO STANCO		8 FOREST AVE. GLEN COVE NY 11542	05/24/2024	05/24/2029
DOL	DOL		ANGELO TONDO		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	*****4231	ANKER'S ELECTRIC SERVICE, INC.		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL		ANTHONY MONGELLI		PO BOX 2064 MONROE NY 10950	02/12/2024	02/12/2029
DOL	NYC		ARADCO CONSTRUCTION CORP		115-46 132RD ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	DOL		ARNOLD A. PAOLINI		1250 BROADWAY ST BUFFALO NY 14212	02/03/2020	02/03/2025
DOL	NYC		ARSHAD MEHMOOD		168-42 88TH AVENUE JAMAICA NY 11432	11/20/2019	11/20/2024
DOL	NYC		AVM CONSTRUCTION CORP		117-72 123RD ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	NYC		AZIDABEGUM		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	DOL	*****8421	B & B DRYWALL, INC		206 WARREN AVE APT 1WHITE PLAINS NY 10603	12/14/2021	12/14/2026
DOL	DOL		B&L RENOVATION CO.		618 OCEAN PARKWAY APT A6BROOKLYN NY 11230	09/17/2020	09/17/2025
DOL	DOL		BERNARD BEGLEY		38 LONG RIDGE ROAD BEDFORD NY 10506	12/18/2019	12/18/2024
DOL	NYC	*****2113	BHW CONTRACTING, INC.		401 HANOVER AVENUE STATEN ISLAND NY 10304	01/11/2021	01/11/2026
DOL	DOL	*****3627	BJB CONSTRUCTION CORP.		38 LONG RIDGE ROAD BEDFORD NY 10506	12/18/2019	12/18/2024
DOL	DOL	*****5078	BLACK RIVER TREE REMOVAL, LLC		29807 ANDREWS ROAD BLACK RIVER NY 13032	10/17/2023	10/17/2028
DOL	DOL		BRADLEY J SCHUKA		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	DOL	*****9383	C.C. PAVING AND EXCAVATING, INC.		2610 SOUTH SALINA ST SUITE 12SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL	*****4083	C.P.D. ENTERPRISES, INC		P.O BOX 281 WALDEN NY 12586	03/03/2020	03/03/2025
DOL	DOL	*****5161	CALADRI DEVELOPMENT CORP.		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	DOL	*****3391	CALI ENTERPRISES, INC.		1223 PARK STREET PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	NYC		CALVIN WALTERS		465 EAST THIRD ST MT. VERNON NY 10550	09/09/2019	09/09/2024
DOL	DOL	*****4155	CASA BUILDERS, INC.	FRIEDLANDER CONSTRUCTION	64 N PUTT CONNERS ROAD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	AG	*****7247	CENTURY CONCRETE CORP		2375 RAYNOR ST RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****0026	CHANTICLEER CONSTRUCTION LLC		4 BROTHERS ROAD WAPPINGERS FALLS NY 12590	10/20/2020	10/20/2025
DOL	NYC	*****2117	CHARAN ELECTRICAL		9-11 40TH AVENUE	09/26/2023	09/26/2028

NYSDOL Bureau of Public Work Debarment List 08/09/2024

Article 8

DOL	NYC		CHARLES ZAHRADKA		863 WASHINGTON STREET FRANKLIN SQUARE NY 11010	03/10/2020	03/10/2025
DOL	DOL		CHRISTOPHER GRECO		26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026
DOL	DOL		CRAIG JOHANSEN		10 SOUTH 5TH ST LOCUST VALLEY NY 11560	09/26/2022	09/26/2027
DOL	DOL	*****3228	CROSS-COUNTY LANDSCAPING AND TREE SERVICE, INC.	ROCKLAND TREE SERVICE	26 NORTH MYRTLE AVENUE SPRING VALLEY NY 10956	02/18/2021	02/18/2026
DOL	DOL	*****7619	DANCO CONSTRUCTION UNLIMITED INC.		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL		DANIEL ROBERT MCNALLY		7 GREENFIELD DRIVE WARWICK NY 10990	03/25/2022	03/25/2027
DOL	DOL		DARIAN L COKER		2610 SOUTH SALINA ST SUITE 2CSYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL		DAVID FRIEDLANDER		64 NORTH PUTT CORNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	NYC		DAVID WEINER		14 NEW DROP LANE 2ND FLOORSTATEN ISLAND NY 10306	11/14/2019	11/14/2024
DOL	DOL		DINA TAYLOR		64 N PUTT CONNERS RD NEW PALTZ NY 12561	05/10/2023	05/10/2028
DOL	DOL	*****5175	EAGLE MECHANICAL AND GENERAL CONSTRUCTION LLC		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025
DOL	AG		EDWIN HUTZLER		23 NORTH HOWELLS RD BELLPORT NY 11713	08/04/2021	08/04/2026
DOL	DA		EDWIN HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****0780	EMES HEATING & PLUMBING CONTR		5 EMES LANE MONSEY NY 10952	01/20/2002	01/20/3002
DOL	DOL		EMIL KISZKO		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	*****3298	EMJACK CONSTRUCTION CORP.		84 DIAMOND ST BROOKLYN NY 11222	07/18/2024	07/18/2029
DOL	DOL	*****3298	EMJACK CONSTRUCTION LLC		4192 SIR ANDREW CIRCLE DOYLESTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL		EUGENIUSZ "GINO" KUCHAR		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	DA		FREDERICK HUTZLER		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	NYC	*****6616	G & G MECHANICAL ENTERPRISES, LLC.		1936 HEMPSTEAD TURNPIKE EAST MEDOW NY 11554	11/29/2019	11/29/2024
DOL	DOL	*****2998	G.E.M. AMERICAN CONSTRUCTION CORP.		195 KINGSLAND AVE BROOKLYN NY 11222	12/22/2023	12/22/2028
DOL	NYC		GAYATRI MANGRU		21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	DA		GEORGE LUCEY		150 KINGS STREET BROOKLYN NY 11231	01/19/1998	01/19/2998
DOL	DA		GIOVANNA TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DA	*****0213	GORILLA CONTRACTING GROUP, LLC		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DOL		HANS RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	DOL		HERBERT CLEMEN		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	*****9211	J. WASE CONSTRUCTION CORP.		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
DOL	DOL		J.M.J CONSTRUCTION		151 OSTRANDER AVENUE SYRACUSE NY 13205	11/21/2022	11/21/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON CONSTRUCTION		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R. NELSON, LLC		531 THIRD STREET	10/25/2022	10/25/2027

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DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	12/12/2022	12/12/2027
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		J.R.N COMPANIES, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL	*****1147	J.R.N. CONSTRUCTION, LLC		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JAMES J. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		JASON P. RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****7993	JBS DIRT, INC.		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL	*****2435	JEFFEL D. JOHNSON	JMJ7 AND SON	5553 CAIRNSTRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JEFFEL JOHNSON ELITE CARPENTER REMODEL AND CONSTRUCTION		C2 EVERGREEN CIRCLE LIVERPOOL NY 13090	11/21/2022	11/21/2027
DOL	DOL	*****2435	JEFFREY M. JOHNSON	JMJ7 AND SON	5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	NYC		JENNIFER GUERRERO		1936 HEMPSTEAD TURNPIKE EAST MEADOW NY 11554	11/29/2019	11/29/2024
DOL	DOL		JIM PLAUGHER		17613 SANTE FE LINE ROAD WAYNEFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL		JMJ7 & SON CONSTRUCTION, LLC		5553 CAIRNS TRAIL LIVERPOOL NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 AND SONS CONTRACTORS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS		7014 13TH AVENUE BROOKLYN NY 11228	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS AND SONS		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JMJ7 CONTRACTORS, LLC		5553 CAIRNS TRAIL CLAY NY 13041	11/21/2022	11/21/2027
DOL	DOL		JOHN GOCEK		14B COMMERCIAL AVE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	DOL		JOHN MARKOVIC		47 MANDON TERRACE HAWTHORN NJ 07506	03/29/2021	03/29/2026
DOL	DOL		JOHN WASE		8545 RT 9W ATHENS NY 12015	03/09/2021	03/09/2026
DOL	DOL		JORGE RAMOS		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	DOL		JOSEPH K. SALERNO		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL		JOSEPH K. SALERNO II		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL	*****5116	JP RACE PAINTING, INC. T/A RACE PAINTING		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		JRN CONSTRUCTION CO, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL	*****1147	JRN CONSTRUCTION, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027

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DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		JRN PAVING, LLC		531 THIRD STREET ALBANY NY 12206	11/07/2023	11/07/2028
DOL	DOL		JULIUS AND GITA BEHREND		5 EMES LANE MONSEY NY 10952	11/20/2002	11/20/3002
DOL	DOL		KARIN MANGIN		796 PHELPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	DOL		KATE E. CONNOR		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026
DOL	DOL		KEAN INDUSTRIES, LLC		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL	*****2959	KELC DEVELOPMENT, INC		7088 INTERSTATE ISLAND RD SYRACUSE NY 13209	03/31/2021	03/31/2026
DOL	DOL		KIMBERLY F. BAKER		7901 GEE ROAD CANASTOTA NY 13032	08/17/2021	08/17/2026
DOL	DOL		KMA GROUP II, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL	*****1833	KMA GROUP INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KMA INSULATION, INC.		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028
DOL	DOL		KRIN HEINEMANN		2345 ROUTE 52, SUITE 2N HOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	NYC		KULWANT S. DEOL		9-11 40TH AVENUE LONG ISLAND CITY NY 11101	09/26/2023	09/26/2028
DOL	DA	*****8816	LAKE CONSTRUCTION AND DEVELOPMENT CORPORATION		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	10/25/2022	10/25/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	12/22/2022	12/22/2027
DOL	DOL		LEROY E. NELSON JR		531 THIRD ST ALBANY NY 12206	11/07/2023	11/07/2028
DOL	AG	*****3291	LINTECH ELECTRIC, INC.		3006 TILDEN AVE BROOKLYN NY 11226	02/16/2022	02/16/2027
DOL	DOL		LOUIS A. CALICCHIA		1223 PARK ST. PEEKSKILL NY 10566	05/17/2021	05/17/2026
DOL	NYC		LUBOMIR PETER SVOBODA		27 HOUSMAN AVE STATEN ISLAND NY 10303	12/26/2019	12/26/2024
DOL	NYC		M & L STEEL & ORNAMENTAL IRON CORP.		27 HOUSMAN AVE STATEN ISLAND NY 10303	12/26/2019	12/26/2024
DOL	DOL	*****2196	MAINSTREAM SPECIALTIES, INC.		11 OLD TOWN RD SELKIRK NY 12158	02/02/2021	02/02/2026
DOL	DA		MANUEL P TOBIO		150 KINGS STREET BROOKLYN NY 14444	08/19/1998	08/19/2998
DOL	DA		MANUEL TOBIO		150 KINGS STREET BROOKLYN NY 11231	08/19/1998	08/19/2998
DOL	DOL		MAQSOOD AHMAD		618 OCEAN PKWY BROOKLYN NY 11230	09/17/2020	09/17/2025
DOL	NYC		MARIA NUBILE		84-22 GRAND AVENUE ELMHURST NY 11373	03/10/2020	03/10/2025
DOL	NYC	*****9926	MILLENNIUM FIRE PROTECTION, LLC		325 W. 38TH STREET SUITE 204NEW YORK NY 10018	11/14/2019	11/14/2024
DOL	NYC	*****0627	MILLENNIUM FIRE SERVICES, LLC		14 NEW DROP LNE 2ND FLOORSTATEN ISLAND NY 10306	11/14/2019	11/14/2024
DOL	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	10/25/2022	10/25/2027
DOL	DOL	*****1320	MJC MASON CONTRACTING, INC.		42 FOWLER AVENUE CORTLAND MANOR NY 10567	01/24/2023	01/24/2028
DOL	NYC		MUHAMMED A. HASHEM		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	NYC		NAMOW, INC.		84-22 GRAND AVENUE ELMHURST NY 11373	03/10/2020	03/10/2025
DOL	DOL	*****7790	NATIONAL BUILDING & RESTORATION CORP		1010 TILDEN AVE UTICA NY 13501	07/24/2023	07/24/2028
DOL	DOL	*****1797	NATIONAL CONSTRUCTION		1010 TILDEN AVE	07/24/2023	07/24/2028

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DOL	NYC		NAVIT SINGH		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		NELCO CONTRACTING, LLC		1024 BROADWAY ALBANY NY 12204	11/07/2023	11/07/2028
DOL	DA		NICHOLAS T. ANALITIS		505 MANHATTAN AVE WEST BABYLON NY 11704	10/05/2023	10/05/2028
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	03/01/2022	03/01/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	11/15/2022	11/15/2027
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	09/29/2021	09/29/2026
DOL	DOL		NICHOLE E. FRASER A/K/A NICHOLE RACE		3469 STATE RT. 69 PERISH NY 13131	02/09/2022	02/09/2027
DOL	DOL	*****7429	NICOLAE I. BARBIR	BESTUCCO CONSTRUCTI ON, INC.	444 SCHANTZ ROAD ALLENTOWN PA 18104	09/17/2020	09/17/2025
DOL	NYC	*****5643	NYC LINE CONTRACTORS, INC.		402 JERICHO TURNPIKE NEW HYDE PARK NY 11040	08/10/2022	08/10/2027
DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL		PATRICK PENNACCHIO		2345 RT. 52 SUITE 2NHOPEWELL JUNCTION NY 12533	12/18/2023	12/18/2028
DOL	DOL		PAULINE CHAHALES		935 S LAKE BLVD MAHOPAC NY 10541	03/02/2021	03/02/2026
DOL	DOL		PETER STEVENS		11 OLD TOWN ROAD SELKIRK NY 12158	02/02/2021	02/02/2026
DOL	DOL		PETER STEVENS		8269 21ST ST BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	DOL	*****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	07/12/2024	07/12/2029
DOL	DOL	*****4168	PHANTOM CONSTRUCTION CORP.		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029
DOL	DOL	*****0466	PRECISION BUILT FENCES, INC.		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	NYC		RASHEL CONSTRUCTION CORP		524 MCDONALD AVENUE BROOKLYN NY 11218	09/17/2020	09/17/2025
DOL	DOL	*****1068	RATH MECHANICAL CONTRACTORS, INC.		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	DOL	*****2633	RAW POWER ELECTRIC CORP.		3 PARK CIRCLE MIDDLETOWN NY 10940	07/11/2022	07/11/2027
DOL	DA	*****7559	REGAL CONTRACTING INC.		24 WOODBINE AVE NORTHPORT NY 11768	10/01/2020	10/01/2025
DOL	DOL		RICHARD REGGIO		1617 MAIN ST PEEKSKILL NY 10566	03/03/2020	03/03/2025
DOL	DOL		ROBBYE BISSESAR		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	01/11/2003	01/11/3003
DOL	DOL		ROMEO WARREN		161 ROBYN RD MONROE NY 10950	07/11/2022	07/11/2027
DOL	DOL		RONALD MESSEN		14B COMMERCIAL AVE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	DOL	*****7172	RZ & AL INC.		198 RIDGE AVENUE VALLEY STREAM NY 11581	06/06/2022	06/06/2027
DOL	DOL		SAL FRESINA MASONRY CONTRACTORS, INC.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL		SAL MASONRY CONTRACTORS, INC.		(SEE COMMENTS) SYRACUSE NY 13202	07/16/2021	07/16/2026
DOL	DOL	*****9874	SALFREE ENTERPRISES INC		P.O BOX 14 2821 GARDNER RDPOMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		SALVATORE A FRESINA A/K/A SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	DOL		SAM FRESINA		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13218	07/16/2021	07/16/2026
DOL	NYC	*****0349	SAM WATERPROOFING INC		168-42 88TH AVENUE APT.1 AJAMAICA NY 11432	11/20/2019	11/20/2024
DOL	DA	*****0476	SAMCO ELECTRIC CORP.		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	NYC	*****1130	SCANA CONSTRUCTION CORP.		863 WASHINGTON STREET FRANKLIN SQUARE NY 11010	03/10/2020	03/10/2025

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DOL	DOL	*****2045	SCOTT DUFFIE	DUFFIE'S ELECTRIC, INC.	P.O BOX 111 CORNWALL NY 12518	03/03/2020	03/03/2025
DOL	DOL		SCOTT DUFFIE		P.O BOX 111 CORNWALL NY 12518	03/03/2020	03/03/2025
DOL	DA		SILVANO TRAVALJA		3735 9TH ST LONG ISLAND CITY NY 11101	01/05/2023	01/05/2028
DOL	DOL	*****0440	SOLAR GUYS INC.		8970 MIKE GARCIA DR MANASSAS VA 20109	07/16/2021	07/16/2026
DOL	NYC		SOMATIE RAMSUNAHAI		115-46 132ND ST SOUTH OZONE PARK NY 11420	09/17/2020	09/17/2025
DOL	DOL	*****2221	SOUTH BUFFALO ELECTRIC, INC.		1250 BROADWAY ST BUFFALO NY 14212	02/03/2020	02/03/2025
DOL	NYC	*****3661	SPANIER BUILDING MAINTENANCE CORP		200 OAK DRIVE SYOSSET NY 11791	03/14/2022	03/14/2027
DOL	DOL		STANADOS KALOGELAS		485 RAFT AVENUE HOLBROOK NY 11741	10/19/2021	10/19/2026
DOL	DOL	*****3496	STAR INTERNATIONAL INC		89-51 SPRINGFIELD BLVD QUEENS VILLAGE NY 11427	08/11/2003	08/11/3003
DOL	DOL	*****6844	STEAM PLANT AND CHX SYSTEMS INC.		14B COMMERCIAL AVENUE ALBANY NY 12065	11/14/2019	11/14/2024
DOL	DOL	*****9528	STEEL-IT, LLC.		17613 SANTE FE LINE ROAD WAYNESFIELD OH 45896	07/16/2021	07/16/2026
DOL	DOL	*****3800	SUBURBAN RESTORATION CO. INC.		5-10 BANTA PLACE FAIR LAWN PLACE NJ 07410	03/29/2021	03/29/2026
DOL	DOL	*****9150	SURGE INC.		8269 21ST STREET BELLEROSE NY 11426	12/22/2022	12/22/2027
DOL	DOL		SYED RAZA		198 RIDGE AVENUE NY 11581	06/06/2022	06/06/2027
DOL	DOL		TARLOK SINGH		95-27 116TH STREET QUEENS NY 11419	05/28/2024	05/28/2029
DOL	DOL		TARLOK SINGH		95-27 116TH STREET QUEENS NY 11419	07/12/2024	07/12/2029
DOL	DOL		TERRY THOMPSON		11371 RIDGE RD WOLCOTT NY 14590	02/03/2020	02/03/2025
DOL	DOL	*****9733	TERSAL CONSTRUCTION SERVICES INC		107 FACTORY AVE P.O BOX 11070SYRACUSE NY 13208	07/16/2021	07/16/2026
DOL	DOL		TERSAL CONTRACTORS, INC.		221 GARDNER RD P.O BOX 14POMPEI NY 13138	07/16/2021	07/16/2026
DOL	DOL		TERSAL DEVELOPMENT CORP.		1935 TEALL AVENUE SYRACUSE NY 13206	07/16/2021	07/16/2026
DOL	DOL	*****5766	THE COKER CORPORATION	COKER CORPORATIO N	2610 SOUTH SALINA ST SUITE 14SYRACUSE NY 13205	09/17/2020	09/17/2025
DOL	DOL		TIMOTHY PERCY		29807 ANDREWS ROAD BLACK RIVER NY 13612	10/17/2023	10/17/2028
DOL	DA	*****1050	TRI STATE CONSTRUCTION OF NY CORP.		50-39 175TH PLACE FRESH MEADOWS NY 11365	03/28/2022	03/28/2027
DOL	DA	*****4106	TRIPLE H CONCRETE CORP		2375 RAYNOR STREET RONKONKOMA NY 11779	08/04/2021	08/04/2026
DOL	DOL	*****8210	UPSTATE CONCRETE & MASONRY CONTRACTING CO INC		449 WEST MOMBSHA ROAD MONROE NY 10950	06/06/2022	06/06/2027
DOL	DOL	*****6418	VALHALLA CONSTRUCTION, LLC.		796 PHLEPS ROAD FRANKLIN LAKES NJ 07417	12/01/2020	12/01/2025
DOL	NYC	*****2426	VICKRAM MANGRU	VICK CONSTRUCTI ON	21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	NYC		VICKRAM MANGRU		21 DAREWOOD LANE VALLEY STREAM NY 11581	09/17/2020	09/17/2025
DOL	DOL		VIKTORIA RATH		24 ELDOR AVENUE NEW CITY NY 10956	02/03/2020	02/03/2025
DOL	NYC	*****3673	WALTERS AND WALTERS, INC.		465 EAST AND THIRD ST MT. VERNON NY 10550	09/09/2019	09/09/2024
DOL	DOL	*****8266	WILLIAM CHRIS MCCLENDON	MCCLENDON ASPHALT PAVING	1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM CHRIS MCCLENDON		1646 FALLS STREET NIAGARA FALLS NY 14303	05/01/2023	05/01/2028
DOL	DOL		WILLIAM G. PROERFRIEDT		85 SPRUCEWOOD ROAD WEST BABYLON NY 11704	01/19/2021	01/19/2026
DOL	DOL	*****5924	WILLIAM G. PROPHY, LLC	WGP CONTRACTIN	54 PENTAQUIT AVE BAYSHORE NY 11706	01/19/2021	01/19/2026

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DOL	DOL		WILLIAM SCRIVENS		4192 SIR ANDREW CIRCLE DOYELSTOWN PA 18902	07/18/2024	07/18/2029
DOL	DOL		XENOFON EFTHIMIADIS		29-10 38TH AVENUE LONG ISLAND CITY NY 11101	10/11/2023	10/11/2028

PROJECT LABOR AGREEMENT (PLA)

DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

Division of Engineering

PROJECT LABOR AGREEMENT

(Contract No. *{Insert Contract Number}*)

COVERING

CONSTRUCTION PERFORMED

ON BEHALF OF

WESTCHESTER COUNTY, NEW YORK

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PROJECT LABOR AGREEMENT
COVERING CONSTRUCTION WORK PERFORMED
ON BEHALF OF WESTCHESTER COUNTY, NEW YORK

ARTICLE 1 - PREAMBLE

WHEREAS, *{Insert Name of Contractor}* (the "Contractor") on behalf of itself, and reflecting the objectives of the owner, **Westchester County, New York** (the "County"), desires to provide for the efficient, safe, quality, and timely completion of the following construction project: *{Insert Contract Title}* (the "Project") in a manner designed to afford the lowest reasonable costs to the County and the public it represents, and the advancement of public policy objectives;

WHEREAS, this Project Labor Agreement will foster the achievement of these goals, inter alia, by:

1. avoiding the costly delays of potential strikes, slowdowns, walkouts, picketing and other disruptions arising from work disputes and promote labor harmony and peace for the duration of the Project;

2. standardizing the terms and conditions governing the employment of labor on the Project;

3. permitting wide flexibility in work scheduling and shift hours and times;

4. receiving negotiated adjustments to work rules and staffing requirements from those which otherwise might control;

5. providing comprehensive and standardized mechanisms for the settlement of work disputes, including but not limited to, those relating to jurisdiction;

6. ensuring a reliable source of skilled and experienced labor;

7. furthering public policy objectives as to improved employment opportunities for minorities, women and the economically disadvantaged in the construction industry;

8. minimizing potential losses of revenues through timely completion of contracts;

9. expediting the construction process and otherwise minimizing the inconveniences of citizens of the County; and

WHEREAS, the parties desire to maximize Project safety conditions for both workers and the public;

NOW, THEREFORE, the parties enter into this Agreement:

SECTION 1 - PARTIES TO THE AGREEMENT

This is a Project Labor Agreement ("Agreement") entered into by and between the Contractor, on behalf of itself and its successors, assigns and its subcontractors engaged in On-Site Project Work as defined in Article 3; and by the Building and Construction Trades Council of Westchester and Putnam Counties, New York AFL-CIO, on behalf of itself and all of its affiliated Local Unions that perform On-Site Project Work and their members.

ARTICLE 2 - GENERAL CONDITIONS

SECTION 1 - DEFINITIONS

Throughout this Agreement, "Council" shall refer to the Building and Construction Trades Council of Westchester and Putnam Counties, New York AFL-CIO. "Local Unions" shall refer to all of the Council's affiliated Local Unions that perform On-Site Project Work and their members. "Contractor(s)" shall include the Contractor, all other contractors who sign a similar Project Labor Agreement in connection with the Project and their subcontractors of whatever tier, engaged in On-Site Project Work within the scope of this Agreement as defined in Article 3.

SECTION 2 - CONDITIONS FOR AGREEMENT TO BECOME EFFECTIVE

This Agreement shall not become effective unless each of the following conditions is met: (1) the Agreement is signed by the Council on behalf of itself and all of its affiliated Local Unions that perform On-Site Project Work; (2) the Agreement is signed by the Contractor; and (3) the Agreement is approved by the County.

SECTION 3 - ENTITIES BOUND & ADMINISTRATION OF AGREEMENT

This Agreement shall be binding on the Council, the Local Unions and the Contractors performing On-site Project Work, including site preparation and staging areas, as defined in Article 3. The Contractors shall include in any subcontract that they let, for performance during the term of this Agreement, a requirement that each and every one of their subcontractors, of whatever tier, become bound by this Agreement with respect to subcontracted work performed within the scope of Article 3. This Agreement shall be administered by the Contractor, on behalf of itself and its subcontractors. In the event a

Contractor desires to review the provisions of a Local Union's collective bargaining agreement, that Contractor shall request a copy of same from the Council and the Council shall provide same without delay.

SECTION 4 - SUPREMACY CLAUSE

This Agreement together with the applicable collective bargaining agreements of the Local Unions, copies of which can be obtained from the Council, represents the complete understanding of all signatories and supersedes any national agreement, local agreement or collective bargaining agreement of any type which would otherwise apply to this Project, in whole or in part. Where a subject covered by the provisions, explicit or implicit, of this Agreement is also covered by the collective bargaining agreements of one or more of the Local Unions, the provisions of this Agreement shall prevail. It is further understood that no Contractor or subcontractor shall be required to sign any other agreement with the Council or the Local Unions as a condition of performing work on this Project. No practice, understanding or agreement between a Contractor and a Local Union which is not set forth or referenced in this Agreement shall be binding on this Project unless endorsed in writing by the Contractor or subcontractor.

SECTION 5 - LIABILITY

The liability of any Contractor or subcontractor and the liability of any Local Union under this Agreement shall be several and not joint. The Contractor and any subcontractor shall not be liable for any violations of this Agreement by any other contractor, and the Council and Local Unions shall not be liable for any violations of this Agreement by any other Local Union.

SECTION 6 - THE COUNTY

The County requires in its bid specifications that all successful bidders become bound by and signatory to this Agreement for work within the scope of Article 3. In addition, all of their subcontracts shall provide that their subcontractors are subject to all terms and conditions set forth in this Agreement as if signatories thereto. The County is not a party to this Agreement and shall not be liable in any manner under this Agreement. It is understood that nothing in this Agreement shall be construed as limiting the sole discretion of the County in determining which Contractors shall be awarded contracts for Project work; nor as limiting any of the rights or remedies of the County as set forth in any and all of the Contract Documents that pertain in any way to the Project. It is further understood that the County has sole discretion at any time to terminate, delay or suspend the work, in whole or in part, on this Project.

SECTION 7 - AVAILABILITY & APPLICABILITY TO ALL SUCCESSFUL BIDDERS

The Local Unions agree that this Agreement will be made available to, and will fully apply to any successful bidder for Project work who becomes signatory hereto, without regard to whether that successful bidder performs work at other sites on either a union or non-union basis and without regard to whether employees of such successful bidder are, or are not, members of any union. This Agreement shall not apply to the work of any contractor or subcontractor which is performed at any location other than the Project site, as defined in Article 3, Section 1.

ARTICLE 3 - SCOPE OF THIS AGREEMENT

The Project work covered by this Agreement shall be as defined and limited by the following sections of this Article.

SECTION 1 - THE WORK

This Agreement shall only apply to On-Site Project Work performed in connection with the Project.

"On-Site Project Work" shall be defined to include Project work performed at the Project site and preparation and staging areas located within 15 miles of the Project site.

SECTION 2 - EXCLUDED EMPLOYEES

The following persons are not subject to the provisions of this Agreement, even though performing On-Site Project Work:

a) Superintendents, supervisors (excluding field engineers/supervisors, general and forepersons specifically covered by a Local Union's collective bargaining agreement), engineers, inspectors and testers, quality control/assurance personnel, timekeepers, mail carriers, clerks, office workers, messengers, guards, technicians, non-manual employees, and all professional, engineering, administrative and management persons;

b) Employees of the County, or of any State agency, authority or entity or employees of any municipality or other public employer;

c) Employees and entities engaged in off-site manufacture, modifications, repair, maintenance, assembly, painting, handling or fabrication of components, materials, equipment or machinery or involved in deliveries to and from the Project site, excepting local deliveries of all major

construction materials including fill, ready mix concrete, asphalt and sub-base stone/gravel materials which are covered by this Agreement;

d) Employees of the Contractor, other contractors or subcontractors excepting those performing manual, on-site construction labor who will be covered by this Agreement;

e) Employees engaged in on-site equipment maintenance/warranty work. When a Contractor has on site an employee already certified by the relevant manufacturer to make warranty repairs on that Contractor's equipment, that employee shall be used; when a Contractor has on site an employee already qualified to make warranty repairs, although not certified by the equipment manufacturer to do so, that employee shall be used to make repairs working under the direction of a manufacturer certified warranty representative. Notwithstanding the foregoing, if a Contractor, in order to satisfy the warranty requirements of a manufacturer must utilize a person or entity designated by the manufacturer, it may do so without coverage under this Agreement;

f) Employees engaged in laboratory or specialty testing or inspections whether on or off-site.

g) Employees engaged in geophysical testing (whether land or water) other than boring for core samples;

h) Employees engaged in ancillary Project work performed by third parties such as electric utilities, gas utilities, telephone companies, and railroads.

SECTION 3 - NON-APPLICATION TO CERTAIN ENTITIES

This Agreement shall not apply to the parents, affiliates, subsidiaries, or other joint or sole ventures of any Contractors which do not perform work at this Project. It is agreed, for the purposes of this Agreement only, that this Agreement does not have the effect of creating any joint employment, single employer or alter ego status among the County and the Contractors. This Agreement shall further not apply to the County or any other state agency, authority, or other municipal or public entity and nothing contained herein shall be construed to prohibit or restrict the County or its employees or any other state authority, agency or entity and its employees from performing on or off-site work related to the Project.

SECTION 4 - COUNTY LIABILITY

The County shall not be liable, directly or indirectly, to any party for any act or omission of the Contractor, any other contractors or subcontractors, the Council or Local Unions, including but not limited to, any violation or breach of this Agreement by any of the aforementioned.

ARTICLE 4 - UNION RECOGNITION AND EMPLOYMENT

SECTION 1 - PRE-HIRE RECOGNITION

The Contractors recognize the Local Unions as the sole and exclusive bargaining representatives of all trade employees who are performing On-Site Project Work within the scope of this Agreement as defined in Article 3.

SECTION 2 - UNION'S REFERRAL

A. The Contractors agree to hire trade employees covered by this Agreement through the job referral system and hiring halls (where the referrals meet the qualifications set forth in items 1, 2 and 4 of subparagraph B below) established in the collective bargaining agreements of the applicable Local Unions listed in Schedule A. Notwithstanding this, the Contractors shall have the sole right to determine the competency of all referrals; the number of employees required; the selection of employees to be laid off (except as provided in Article 5, Section 3); and to reject any applicant referred by a Local Union, subject to the show-up payments required in the applicable Local Union's collective bargaining agreement. In the event that a Local Union is unable to fill any request for qualified employees within a 48 hour period after such requisition is made by the Contractor (Saturdays, Sundays and Holidays excepted), the Contractor may employ qualified applicants from any other available source. In the event that the Local Union does not have a job referral system, the Contractor shall give the Local Union first preference to refer applicants, subject to the other provisions of this Article. The Contractor shall notify the applicable Local Union of trade employees hired within its jurisdiction from any source other than referral by the Local Union.

B. A Contractor may request by name, and the Local Union will honor, referral of persons who have applied to the Local Union for On-Site Project Work and who meet the following qualifications as determined by a committee of 3 persons (the "Committee") designated, respectively, by the applicable Local Union, the Contractor and a mutually selected third party or, in the absence of agreement, the permanent arbitrator (or designee) designated in Article 7:

1. possess licenses required by New York State law for the On-Site Project Work to be performed by that individual;

2. have worked a total of at least 1000 hours in the applicable construction trade during the prior 3 years;

3. were on the Contractor's active payroll for at least 60 out of the 180 calendar days prior to the contract award;

4. have demonstrated ability to safely perform the basic functions of the applicable trade.

C. No more than 12 per centum of the employees covered by this Agreement, per Contractor by trade, shall be hired through the special provisions above (any fraction shall be rounded to the next highest whole number).

D. The Committee may also allow a Contractor, subject to the above per centum, to employ apprentice equivalents to afford an opportunity to minority, women or economically disadvantaged persons for entry into the construction industry outside of the formal apprenticeship program.

SECTION 3 - NON-DISCRIMINATION IN REFERRALS

The Local Unions represent that their hiring halls and referral systems will be operated in a non-discriminatory manner and in full compliance with all applicable federal, state and local laws and regulations which require equal employment opportunities. Referrals shall not be affected in any way by the rules, regulations, bylaws, constitutional provisions or any other aspects or obligations of union membership, policies or requirements and shall be subject to such other conditions as are established in this Article. No employment applicant shall be discriminated against by any referral system or hiring hall because of the applicant's union membership, or lack thereof.

SECTION 4 - MINORITY AND FEMALE REFERRALS

In the event a Local Union either fails, or is unable, to refer qualified minority or female applicants in percentages equaling Project affirmative action goals as set forth in the County's Project specifications, the Contractor may employ qualified minority or female applicants from any other available source.

SECTION 5 - CROSS AND QUALIFIED REFERRALS

The Local Union shall not knowingly refer to a Contractor an employee then employed by another Contractor working under this Agreement. The Local Unions will exert their utmost efforts to recruit sufficient numbers of skilled and qualified trade employees to fulfill the requirements of the Contractor.

SECTION 6 - UNION DUES

All employees covered by this Agreement shall be subject to the union security provisions contained in the applicable Local Unions' collective bargaining agreements as amended from time to time, but only for the period of time during which they are performing On-Site Project Work and only to the extent of rendering payment of the applicable monthly union dues uniformly required for union membership in the applicable Local Union which represents the trade in which the employee is performing On-Site Project Work. No employee shall be discriminated against at the Project site because of the employee's union membership or lack thereof. In the case of unaffiliated employees, the dues payment will be received by the Local Unions as an agency shop fee.

SECTION 7 - TRADE FOREPERSONS AND GENERAL FOREPERSONS

A. The selection of trade forepersons and/or general forepersons and the number of forepersons required shall be solely the responsibility of the Contractor except where otherwise provided by specific provisions of an applicable Local Union's collective bargaining agreement. All forepersons shall take orders exclusively from the designated Contractor representatives. Trade forepersons shall be designated as working forepersons at the request of the Contractor, except when an existing Local Union's collective bargaining agreement prohibits a foreperson from working when the tradepersons he is leading exceed a specified number.

B. There will be no non-productive employees of any title on the Project.

ARTICLE 5 - UNION REPRESENTATION

SECTION 1 - LOCAL UNION REPRESENTATIVE

Each Local Union representing employees who perform On-Site Project Work shall be entitled to designate in writing (copy to Contractor) one representative, and/or the Business Manager, who shall be afforded access to the Project. The Contractor shall provide a copy of such notification to each of its subcontractors.

SECTION 2 - STEWARDS

A. Each Local Union shall have the right to designate a working journeyperson as a Steward and an alternate, and shall notify the Contractor of the identity of the designated Steward (and alternate) prior to the assumption of such duties. Stewards shall not exercise supervisory functions and will

receive the regular rate of pay for their trade classifications. There will be no non-working Stewards on the Project.

B. In addition to their work as employees, Stewards shall have the right to receive complaints or grievances and to discuss and assist in their adjustment with the Contractor's appropriate supervisor. Each Steward shall be concerned with the employees of the Steward's Contractor, and, if applicable, subcontractors of the Contractor, but not with the employees of any other contractor. The Contractor will not discriminate against the Steward in the proper performance of Union duties.

C. The Stewards shall not have the right to determine when overtime shall be worked, or who shall work overtime except pursuant to a provision in a Local Union's collective bargaining agreement providing procedures for the equitable distribution of overtime.

SECTION 3 - LAYOFF OF A STEWARD

Contractors agree to notify the appropriate Union 24 hours prior to the layoff of a Steward, except in cases of discipline or discharge for just cause. If a Steward is protected against layoff by a Local Union's collective bargaining agreement, such provisions shall be recognized to the extent the Steward possesses the necessary qualifications to perform the work required. In any case in which a Steward is discharged or disciplined for just cause, the Local Union involved shall be notified immediately by the Contractor.

ARTICLE 6 - MANAGEMENT'S RIGHTS

SECTION 1 - RESERVATION OF RIGHTS

Except as expressly limited by a specific provision of this Agreement, the Contractor retains full and exclusive authority for the management of the Project operations including, but not limited to: the right to direct the work force, including determination as to the number to be hired and the qualifications therefore; the promotion, transfer, and layoff of its employees; the discipline or discharge for just cause of its employees; the assignment and schedule of work; the promulgation of reasonable Project work rules; and, the requirement, timing and number of employees to be utilized for overtime work. No rules, customs, or practices which limit or restrict productivity or efficiency of the individual, as determined by the Contractor, and/or joint working efforts with other employees shall be permitted or observed.

SECTION 2 - MATERIALS, METHODS & EQUIPMENT

There shall be no limitation or restriction upon the Contractor's choice of materials, techniques, methods, technology or design, or, regardless of source or location, upon the use and installation of equipment, machinery, package units, pre-cast, pre-fabricated, pre-finished, or pre-assembled materials, tools or other labor-saving devices. Contractors may, without restriction, install or use materials, supplies or equipment regardless of their source. The on-site installation or application of such items shall be performed by the trade having jurisdiction over such work; provided, however, it is recognized that other personnel having special qualifications may participate, in a supervisory capacity, in the installation, check-off or testing of specialized or unusual equipment or facilities as designated by the Contractor. There shall be no restrictions as to work which is not On-Site Project Work.

ARTICLE 7 - WORK STOPPAGES AND LOCKOUTS

SECTION 1 - NO STRIKES - NO LOCKOUTS

There shall be no strikes, sympathy strikes, picketing, work stoppages, slowdowns, hand billing, demonstrations or other disruptive activity at the Project for any reason by any Local Union or employee against any Contractors or employer while performing On-Site Project Work. There shall be no other Local Union, or concerted or employee activity which disrupts or interferes with the operation of the Contractors or the County. Failure of any Local Union or employee to cross any picket line established by any union, signatory or non-signatory to this Agreement, or the picket or demonstration line of any other organization, at or in proximity to the On-Site Project Work shall be deemed a violation of this Article. There shall be no lockout at the Project by any Contractor. Contractors and Local Unions shall take all steps necessary to ensure compliance with this Section 1 and to ensure uninterrupted construction for the duration of this Agreement.

SECTION 2 - DISCHARGE FOR VIOLATION

Contractors may discharge any employee violating Section 1, above, and any such employee will not be eligible thereafter for referral under this Agreement for a period of 100 days.

SECTION 3 - NOTIFICATION

If the Contractor contends that any Local Union has violated this Article, it will notify the President of the Council advising of such fact, with copies of the notification to the Local Union. The President of the Council shall instruct, order and otherwise use its best efforts to cause the employees and/or the Local

Unions to immediately cease and desist from any violation of this Article. The Council, in complying with these obligations, shall not be liable for the unauthorized acts of a Local Union or its members.

SECTION 4 - EXPEDITED ARBITRATION

Any Contractor or Local Union alleging a violation of Section 1 of this Article may utilize the expedited procedure set forth below in lieu of, or in addition to, any actions at law or equity that may be brought.

A. A party invoking this procedure shall notify the American Arbitration Association to appoint an Arbitrator under this expedited arbitration procedure. Copies of such notification will be simultaneously sent to the alleged violator and, if a Local Union is alleged to be in violation, its International Union, the Council, and the Contractor.

B. Upon appointment in accordance with the rules and regulations of the American Arbitration Association for an expedited arbitration proceeding, the Arbitrator shall thereupon, after notice as to time and place to the Contractor, the Local Union involved, and the Council hold a hearing within 48 hours of receipt of the notice invoking the procedure if it is contended that the violation still exists. The hearing will not, however, be scheduled for less than 24 hours after the notice to the Council required by Section 3, above.

C. All notices pursuant to this Article may be by telephone, telegraph, hand delivery, or fax, confirmed by overnight delivery, to the Arbitrator, Contractor, the involved Local Union and the Council. The hearing may be held on any day including Saturdays or Sundays. The hearing shall be completed in one session, which shall not exceed 8 hours duration (no more than 4 hours being allowed to either side to present their case, and conduct their cross examination) unless otherwise agreed. A failure of any Local Union or Contractor to attend the hearing shall not delay the hearing of evidence by those present or the issuance of an award by the Arbitrator.

D. The sole issue at the hearing shall be whether a violation of Section 1, above, occurred. If a violation is found to have occurred, the Arbitrator shall issue a Cease and Desist Award restraining such violation and serve copies on the Contractor and the Local Union involved. The Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages, which issue is reserved solely for court proceedings, if any. The Award shall be issued in writing within 3 hours after the close of the hearing, and may be issued without an Opinion. If any involved party desires an Opinion, one shall be issued within 15 calendar days, but its issuance shall not delay compliance with, or enforcement of, the Award.

E. An Award issued under this procedure may be enforced by any court of competent jurisdiction upon the filing of this Agreement, together with the Award. Notice of the filing of such enforcement proceedings shall be given to the Local Union or Contractor involved. In any court proceeding to obtain a temporary or preliminary order enforcing the Arbitrator's award as issued under this expedited procedure, the involved Local Union and Contractor waive their right to a hearing and agree that such proceedings may be ex parte, provided notice is given to opposing counsel. Such agreement does not waive any party's right to participate in a hearing for a final court order of enforcement or in any contempt proceeding.

F. Any rights created by statute or law governing arbitration proceedings which are inconsistent with the procedure set forth in this Article, or which interfere with compliance thereto, are hereby waived by the Contractors and Local Unions to whom they accrue.

G. The fees and expenses of the Arbitrator shall be equally divided between the involved Contractor and Local Union.

SECTION 5 - ARBITRATION OF DISCHARGES

Procedures contained in Article 9 shall not be applicable to any alleged violation of this Article, with the single exception that an employee discharged for violation of Section 1, above, may have recourse to the procedures of Article 9 to determine only if the employee did, in fact, violate the provisions of Section 1 of this Article; but not for the purpose of modifying the discipline imposed where a violation is found to have occurred.

ARTICLE 8 - LABOR MANAGEMENT COMMITTEE

SECTION 1 - SUBJECTS

The Project Labor Management Committee (the "Labor Management Committee") will meet on a regular basis to: 1) promote harmonious relations among the contractors and Unions; 2) enhance safety awareness, cost effectiveness and productivity of construction operations; 3) protect the public interests; 4) discuss matters relating to staffing and scheduling with safety and productivity as considerations; 5) review Affirmative Action and equal employment opportunity matters pertaining to the Project; and 6) discuss such other matters as may be desirable or necessary in furtherance of the expeditious completion of the Project.

SECTION 2 - COMPOSITION

The Labor Management Committee shall be composed of one designee each of the Council, the Contractors and the Local Unions involved in the issues being discussed. The Labor Management Committee may conduct business through mutually agreed sub-committees.

ARTICLE 9 - GRIEVANCE & ARBITRATION PROCEDURE

SECTION 1 - PROCEDURE FOR RESOLUTION OF GRIEVANCES

Any question, dispute or claim arising out of, or involving the interpretation or application of this Agreement (other than jurisdictional disputes or alleged violations of Article 7, Section 1) shall be considered a grievance and shall be resolved pursuant to the exclusive procedure described below; provided, in all cases, that the question, dispute or claim arose during the term of this Agreement.

Step 1:

(a) When any employee covered by this Agreement feels aggrieved by a claimed violation of this Agreement, the employee shall, through the Local Union business representative or job steward give notice of the claimed violation to the work site representative of the involved Contractor. To be timely, such notice of the grievance must be given within 14 calendar days after the act, occurrence or event giving rise to the grievance. The business representative of the Local Union or the job steward and the work site representative of the involved Contractor shall meet and endeavor to adjust the matter with 14 calendar days after a timely notice has been given. If they fail to resolve the matter within the prescribed period, the grieving party, may, within 14 calendar days thereafter, pursue Step 2 of the grievance procedure by serving the involved Contractor with written copies of the grievance setting forth a description of the claimed violation, the date on which the grievance occurred, and the provisions of the Agreement alleged to have been violated. Grievances and disputes settled at Step 1 are non-precedential except as to the specific Local Union, employee and Contractor directly involved unless the settlement is accepted in writing by the Contractor as creating a precedent.

(b) Should any Contractor or Local Union have a dispute (excepting jurisdictional disputes or alleged violations of Article 7, Section 1) with any other Contractor or Local Union and after conferring a settlement is not reached within 14 calendar days, the dispute shall be reduced to writing and proceed to Step 2 in the same manner as outlined in subparagraph (a) for the adjustment of employee grievances.

Step 2:

The Business Manager or designee of the involved Local Union, together with representatives of the Council and the involved Contractor, shall meet in Step 2 within 14 calendar days of service of the written grievance to arrive at a satisfactory settlement.

Step 3:

(a) If the grievance shall have been submitted but not resolved in Step 2, any of the participating Step 2 entities may, within 21 calendar days after the initial Step 2 meeting, submit the grievance in writing (copies to other participants) to the American Arbitration Association. The Labor Arbitration Rules of the American Arbitration Association shall govern the appointment and conduct of the arbitration hearing, at which all Step 2 participants shall be parties. The decision of the Arbitrator shall be final and binding on the involved Contractor, Local Union and employees and the fees and expenses of such arbitration shall be borne equally by the involved Contractor and Local Union.

(b) Failure of the grieving party to adhere to the time limits set forth in this Article shall render the grievance null and void. These time limits may be extended only by written consent of the Contractor and the involved Local Union at the particular step where the extension is agreed upon. The Arbitrator shall have authority to make decisions only on the issues presented to him and shall not have the authority to change, add to, delete or modify any provision of this Agreement.

SECTION 2 - LIMITATION AS TO RETROACTIVITY

No arbitration decision or award may provide retroactivity of any kind exceeding 60 calendar days prior to the date of service of the written grievance on the Contractor or Local Union.

ARTICLE 10 - JURISDICTIONAL DISPUTES

SECTION 1 - NO DISRUPTIONS

There will be no strikes, sympathy strikes, work stoppages, slowdowns, picketing or other disruptive activity of any kind arising out of any jurisdictional dispute. Pending the resolution of the dispute, the work shall continue uninterrupted and as assigned by the Contractor. No jurisdictional dispute shall excuse a violation of Article 7.

SECTION 2 - ASSIGNMENT

All On-Site Project Work assignments shall be made pursuant to law.

SECTION 3 - PROCEDURE FOR SETTLEMENT OF JURISDICTIONAL DISPUTES

A. Any Local Union having a jurisdictional dispute with respect to On-Site Project Work assigned to another Local Union will submit the dispute in writing to the Administrator, Plan for the Settlement of Jurisdictional Disputes in the Construction Industry ("the Plan") within 72 hours and send a copy of the letter to the Local Union and the International Union involved, the President of the Council, the County and the Contractor involved. Upon receipt of a dispute letter from any Local Union, the Administrator will invoke the procedures set forth in the Plan to resolve the jurisdictional dispute. The jurisdictional dispute letter shall contain the information described in Article IV of the Plan.

B. Within 5 calendar days of receipt of the dispute letter, there shall be a meeting of the Contractor involved, the Local Unions involved and the President of the Council for the purpose of resolving the jurisdictional dispute.

C. If the dispute remains unresolved after this meeting, the parties will proceed to final and binding arbitration in accordance with the principles and procedures set forth in the rules of the Plan.

D. The Arbitrator will render a short-form decision within 5 days of the hearing based upon the evidence submitted at the hearing, with a full written decision to follow within 30 days of the close of the hearing.

E. This Jurisdictional Dispute Resolution Procedure will only apply to On-Site Project Work performed by Local Unions. A representative of the County and the International Union involved may also attend the meeting.

F. Any Local Union involved in a jurisdictional dispute on this Project shall continue working in accordance with Section 2 above and without disruption of any kind.

G. Copies of the Plan will be provided by the Council upon request.

SECTION 4 - AWARD

Any jurisdictional award pursuant to Section 3 shall be final and binding on the disputing Local Unions and the involved Contractor on this Project only, and may be enforced in any court of competent

jurisdiction. Such award or resolution shall not establish a precedent on any other construction work not covered by this Agreement. In all disputes under this Article, the involved Contractors shall be considered parties in interest.

SECTION 5 - LIMITATIONS

The Jurisdictional Dispute Arbitrator shall have no authority to assign work to a double crew, that is, to more employees than the minimum required by the involved Contractor to perform the work involved; nor to assign the work to employees who are not qualified to perform work involved; nor to assign work being performed by non-union employees to union employees. This does not prohibit the establishment, with the agreement of the involved Contractor, of composite crews where more than one employee is needed for the job. The aforesaid determinations shall decide only to whom the disputed work belongs.

SECTION 6 - NO INTERFERENCE WITH WORK

There shall be no interference or interruption of any kind with the On-Site Project Work while any jurisdictional dispute is being resolved. The On-Site Project Work shall proceed as assigned by the involved Contractor until finally resolved under the applicable procedure of this Article. The award shall be confirmed in writing to the involved parties. There shall be no strike, work stoppage, or interruption in protest of any such award.

ARTICLE 11 - WAGES AND BENEFITS

SECTION 1 - CLASSIFICATION AND BASE HOURLY RATE

All employees covered by this Agreement shall be classified in accordance with the work performed and paid the base hourly wage rates for those classifications as specified in the applicable Local Unions' collective bargaining agreements, as they may be amended during the term of this Agreement. Recognizing, however, that special conditions may exist or occur on the Project, the parties, by mutual agreement may establish rates and/or hours for one or more classifications which may differ from the applicable collective bargaining agreements. Parties to such agreements shall be the Contractor involved, the involved Local Unions and the Council.

SECTION 2 - EMPLOYEE BENEFIT FUNDS

The Contractors agree to pay contributions on behalf of all employees covered by this Agreement to the established employee benefit funds in the amount designated in the appropriate Local Unions' collective bargaining agreements; provided, however, that the involved Contractors and the Local Unions agree that

only such bona fide employee benefits as are explicitly required under Section 220 of the New York State Labor Law shall be included in this requirement and paid by the Contractors on this Project. Bona fide jointly trusteed fringe benefit plans established or negotiated through collective bargaining during the life of this Agreement may be added if similarly protected under Section 220. Contractors shall not be required to contribute to non-Section 220 benefits, trusts or plans.

The Contractors agree to be bound by the written terms of the legally-established Local Union collective bargaining agreement and/or Trust Agreements specifying the detailed basis on which payments are to be paid into, and benefits paid out of, such Trust Funds but only with regard to work done on this Project and only for those employees to whom this Agreement requires such benefit payments. Copies of such Trust Agreements will be provided by the Council upon request.

ARTICLE 12 - HOURS OF WORK, PREMIUM PAYMENTS, SHIFTS AND HOLIDAYS

SECTION 1 - WORK WEEK AND WORK DAY

A. The standard work week shall consist of 40 hours of work at straight time rates per one of the following schedules:

i.) Five-Day Work Week: Monday-Friday; 5 days, 8 hours plus 1/2 hour unpaid lunch period each day.

ii.) Four-Day Work Week: Monday-Thursday; 4 days, 10 hours plus 1/2 hour unpaid lunch period each day.

B. The day shift shall commence between the hours of 6:00 a.m. and 9:00 a.m. and shall end between the hours of 2:00 p.m. and 7:30 p.m. Starting and quitting times shall occur at the staging areas as may be designated by the Contractor.

C. Scheduling – The Contractor shall have the option of scheduling either a five-day or four-day work week and the work day hours consistent with the Project requirements, the Project schedule and minimization of interference. When conditions beyond the control of the Contractor, such as severe weather, power failure, fire or natural disaster, prevent the performance of On-Site Project Work on a regularly scheduled work day, the Contractor may, with mutual agreement of the involved Local Unions on a trade-by-trade basis, schedule work on Friday (where on four 10s) or Saturday (where on five 8s) during that calendar week in which a work day was lost, at straight

time pay, provided that the employees involved work a total of 40 hours or less during that work week. When conditions on the Project cause the Contractor to stop work or be unable to commence work on the day in question, the Contractor will notify the Local Unions and the employees at that time that Friday or Saturday, as the case may be, will be a make-up day for the affected operation(s) and the Friday or Saturday work will then be at straight time for the day or any portion of the work day that work was stopped. The balance of the day on Friday or Saturday, if any, will be at time and one-half (1/2) the straight time rate of pay. If the Contractor seeks to cancel a day's work in advance of that day and to schedule the following Friday or Saturday as a make-up day, the determination of whether the Contractor is unable to perform the affected work operation(s) shall be jointly made between the Contractor and the involved Local Unions, the Local Unions' agreement not to be unreasonably withheld.

D. Notice – Contractors shall provide not less than five (5) days prior notice to the Local Unions as to the work week and work hours scheduled to be worked or such lesser notice as may be mutually agreed upon.

SECTION 2 - OVERTIME

Overtime pay for hours outside of the standard work week and work day, described in Paragraph A above, shall be paid in accordance with the applicable Local Unions' collective bargaining agreements. There will be no restriction upon the Contractor's scheduling of overtime or the non-discriminatory designation of employees who work. There shall be no pyramiding of overtime pay under any circumstances. The Contractor shall have the right to schedule work so as to minimize overtime.

SECTION 3 - SHIFTS

A. Flexible Schedules - Scheduling of shift work shall remain flexible in order to meet Project schedules and existing Project conditions including the minimization of interference with traffic. It is not necessary to work a day shift in order to schedule a second shift. Shifts must be worked a minimum of five consecutive work days, must have prior approval of the Contractor and/or subcontractor, and must be scheduled with not less than five work days notice to the Local Union.

B. Second Shift - The second shift (starting between 2 p.m. and 8 p.m.) shall consist of 8 hours work (or 10 hours of work) for an equal number of hours pay at the straight time rate plus 15% in lieu of overtime and exclusive of a 1/2 hour unpaid lunch period. Where specifically required by the applicable Local Unions' collective bargaining agreements, employees on second shift, where there are no first shift employees scheduled for that trade, will be paid at time and one-half rates

for such second shift work, but without any shift differential. In all other cases, the first sentence of this paragraph B shall apply.

C. Flexible Starting Times - Shift starting times will be adjusted by the Contractor as necessary to fulfill Project requirements subject to the notice requirements of Paragraph A.

D. Four Tens - When working a four-day work week, the standard work day shall consist of 10 hours work for 10 hours of pay at the straight time rate exclusive of an unpaid 1/2 hour meal period and regardless of the starting time. This provision is applicable to night shifts only, and such night shifts are subject to the shift differential in paragraph B above.

SECTION 4 - HOLIDAYS

A. Schedule - There shall be eight (8) recognized holidays on the Project:

New Year's Day	Labor Day
President's Day	Veterans Day
Memorial Day	Thanksgiving Day
Fourth of July	Christmas Day

All said holidays shall be observed on the dates designated by New York State law. In the absence of such designation, they shall be observed on the calendar date except those holidays which occur on Sunday shall be observed on the following Monday.

B. Payment - Regular holiday pay, if any, and/or premium pay for work performed on such a recognized holiday shall be in accordance with the applicable Local Unions' collective bargaining agreements.

C. Exclusivity - No holidays other than those listed in paragraph A above shall be recognized nor observed.

SECTION 5 - REPORTING PAY

A. Employees who report to the work location pursuant to regular schedule and who are not provided with work or whose work is terminated early by a Contractor, for whatever reason, shall receive minimum reporting pay in accordance with the applicable Local Unions' collective bargaining agreements.

B. When an employee, who has completed his/her scheduled shift and left the Project site, is "called out" to perform special work of a casual, incidental or irregular nature, the employee shall receive

pay for actual hours worked with a minimum guarantee, as may be required by the applicable Local Union's collective bargaining agreement, at the employee's straight time rate.

C. When an employee leaves the job or work location of his/her own volition or is discharged for cause or is not working as a result of the Contractor's invocation of Section 7 below, he/she shall be paid only for the actual time worked.

D. Except as specifically set forth in this Article, there shall be no premiums, bonuses, hazardous duty, high time or other special payment of any kind.

E. There shall be no pay for time not actually worked except as specifically set forth in this Article and except where an applicable Local Union's collective bargaining agreement requires a full week's pay for forepersons.

SECTION 6 - PAYMENT OF WAGES

A. Payday - Payment shall be made by check, drawn on a New York bank with branches located within commuting distance of the job site. Paychecks shall be issued by a Contractor at the job site by 10 a.m. on Thursdays. In the event that the following Friday is a bank holiday, paychecks shall be issued on Wednesday of that week. Not more than 3 days wages shall be held back in any pay period. Paycheck stubs shall contain the name and business address of the Contractor, together with an itemization of deductions from gross wages.

B. Termination - Employees who are laid off or discharged for cause shall be paid in full for that which is due them at the time of termination. The Contractor shall also provide the employee with a written statement setting forth the date of lay off or discharge.

SECTION 7 - EMERGENCY WORK SUSPENSION

A Contractor may, if considered necessary for the protection of life and/or safety of employees or others, suspend all or a portion of On-Site Project Work. In such instances, employees will be paid for actual time worked; provided, however, that when a Contractor requests that employees remain at the job site available for work, employees will be paid for "stand by" time at their hourly rate of pay.

SECTION 8 - INJURY-DISABILITY

An employee who, after commencing work, suffers a work-related injury or disability while performing work duties, shall receive no less than 8 hours wages for that day. Further, the employee shall be rehired

at such time as able to return to duties provided there is still work available on the Project for which the employee is qualified and able to perform.

SECTION 9 - TIME KEEPING

A Contractor may utilize brassing or other systems to check employees in and out. Each employee must check in and out. The Contractor will provide adequate facilities for checking in and out in an expeditious manner.

SECTION 10 - MEAL PERIOD

A Contractor shall schedule an unpaid period of not more than 1/2 hour duration at the work location between the 3rd and 5th hour of the scheduled shift. A Contractor may, for efficiency of operation, establish a schedule which coordinates the meal periods of two or more trades. If an employee is required to work through the meal period, the employee shall be compensated in a manner established in the applicable Local Union's collective bargaining agreement.

SECTION 11 - BREAK PERIODS

There will be no rest periods, organized coffee breaks or other non-working time established during working hours. Individual coffee containers will be permitted at the employee's work location.

ARTICLE 13 - APPRENTICES

SECTION 1 - RATIOS

Recognizing the need to maintain continuing supportive programs designed to develop adequate numbers of competent workers in the construction industry and to provide trade entry opportunities for minorities and women, Contractors will employ apprentices in their respective trades to perform such work as is within their capabilities and which is customarily performed by the trade in which they are indentured. Contractors may utilize apprentices and such other appropriate classifications as are contained in the applicable Local Union's collective bargaining agreement in a ratio not to exceed 25% of the work force by trade (without regard to whether a lesser ratio is set forth in the applicable Local Union's collective bargaining agreement), unless the applicable Local Union's collective bargaining agreement provides for a higher percentage. Apprentices and such other classifications as are appropriate shall be employed in a manner consistent with the provisions of the appropriate Local Union's collective bargaining agreement.

SECTION 2 - DEPARTMENT OF LABOR

To assist the Contractors in attaining a maximum effort on this Project, the Local Unions agree to work in close cooperation with, and accept monitoring by, the New York State Department of Labor and the County to ensure that minorities and women are afforded every opportunity to participate in apprenticeship programs which result in the placement of apprentices on this Project. To further ensure that this contractor effort is attained, up to 50% of the apprentices placed on this Project shall be first year minority or women apprentices as shall be 60% of the apprentice equivalents, placed on the Project, who do not necessarily meet all of the age or entrance requirements for the apprentice program or have not necessarily passed the entrance examination. The Local Unions will cooperate with the contractor requests for minority, women or economically disadvantaged referrals to meet this contractor effort.

ARTICLE 14 - SAFETY PROTECTION OF PERSON AND PROPERTY

SECTION 1 - SAFETY REQUIREMENTS

Each Contractor will ensure that applicable OSHA requirements are at all times maintained on the Project and the employees and the Local Unions agree to cooperate fully with these efforts. Employees must perform their work at all times in a safe manner and protect themselves and the property of the Contractors and the County from injury or harm. Failure to do so will be grounds for discipline, including discharge.

SECTION 2 - CONTRACTOR RULES

Employees covered by this Agreement shall at all times be bound by the reasonable safety, security, and visitor rules as established by the Contractors for this Project. Such rules will be published and posted in conspicuous places throughout the Project.

SECTION 3 - INSPECTIONS

The Contractors retain the right to inspect incoming shipments of equipment, apparatus, machinery and construction materials of every kind.

ARTICLE 15 - NO DISCRIMINATION

SECTION 1 - COOPERATIVE EFFORTS

The Contractors and the Local Unions agree that they will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, national origin, age or

marital status in any manner prohibited by law or regulation. It is recognized that special procedures may be established by the Contractors, the Local Unions and the New York State Department of Labor for the training and employment of persons who have not previously qualified to be employed on construction projects of the type covered by this Agreement. The parties to this Agreement will assist in such programs and agree to use their best efforts to ensure that the goals for female and minority employment are met on this Project.

SECTION 2 - LANGUAGE OF AGREEMENT

The use of the masculine or feminine gender in this Agreement shall be construed as including both genders.

ARTICLE 16 - GENERAL TERMS

SECTION 1 - PROJECT RULES

The Contractors shall establish such reasonable Project rules as are appropriate for the good order of the Project. These rules will be explained at the pre-job conference and posted at the Project site and may be amended thereafter as necessary. Failure of an employee to observe these rules and regulations shall be grounds for discipline, including discharge. The fact that no order was posted prohibiting a certain type of misconduct shall not be a defense to an employee disciplined or discharged for such misconduct when the action taken is for cause.

SECTION 2 - TOOLS OF THE TRADE

The welding/cutting torch and chain fall are tools of the trade having jurisdiction over the work performed. Employees using these tools shall perform any of the work of the trade. There shall be no restrictions on the emergency use of any tools or equipment by any qualified employee or on the use of any tools or equipment for the performance of work within the employee's jurisdictions.

SECTION 3 - SUPERVISION

Employees shall work under the supervision of the trade foreperson or general foreperson.

SECTION 4 - TRAVEL ALLOWANCES

There shall be no payments for travel expenses, travel time, subsistence allowance or other such reimbursements or special pay except as expressly set forth in this Agreement.

SECTION 5 - FULL WORK DAY

Employees shall be at their staging area at the starting time established by the Contractor and shall be returned to their staging area by quitting time after performing their assigned functions under the supervision of the Contractor. The signatories reaffirm their policy of a fair day's work for a fair day's wage.

SECTION 6 - COOPERATION

The Contractor and the Local Unions will cooperate in seeking any New York State Department of Labor approvals that may be required for implementation of any terms of this Agreement.

ARTICLE 17 - SAVINGS AND SEPARABILITY

SECTION 1 - THIS AGREEMENT

In the event that the application of any provision of this Agreement is enjoined, on either an interlocutory or permanent basis, or otherwise found in violation of law, the provision involved shall be rendered, temporarily or permanently, null and void but the remainder of the Agreement shall remain in full force and effect. In such event, the Agreement shall remain in effect for contracts already bid and awarded or in construction where the Contractor voluntarily accepts the Agreement. The parties to this Agreement will enter into negotiations for a substitute provision in conformity with the law and the intent of the parties for contracts to be let in the future.

SECTION 2 - THE BID SPECIFICATIONS

In the event that the County bid specifications, or other action, requiring that a successful bidder become signatory to this Agreement is enjoined, on either an interlocutory or permanent basis, or otherwise found in violation of law such requirement shall be rendered, temporarily or permanently, null and void but the Agreement shall remain in full force and effect to the extent allowed by law. In such event, the Agreement shall remain in effect for contracts already bid and awarded or in construction where the Contractor voluntarily accepts the Agreement. The parties will enter into negotiations as to modifications to the Agreement to reflect the court action taken and the intent of the parties for contracts to be let in the future.

SECTION 3 - NON-LIABILITY

In the event of an occurrence referenced in Section 1 or Section 2 of this Article, neither the County, the Contractors, or any Local Union shall be liable, directly or indirectly, for any action taken, or not taken, to

comply with any court order, injunction or determination. Project bid specifications will be issued in conformance with court orders then in effect and no retroactive payments or other action will be required if the original court determination is ultimately reversed.

SECTION 4 - NON-WAIVER

Nothing in this Article shall be construed as waiving the prohibitions of Article 7 as to Contractors and Local Unions.

ARTICLE 18 - FUTURE CHANGES IN SCHEDULE "A" COLLECTIVE BARGAINING AGREEMENTS

SECTION 1 - CHANGES TO COLLECTIVE BARGAINING AGREEMENTS

A. The Contractors and/or Local Unions who are parties to the collective bargaining agreements which are applicable to the On-Site Project Work shall notify the Contractor in writing of any mutually agreed upon changes in provisions of such agreements and the effective dates of such changes.

B. It is agreed that any provisions negotiated into collective bargaining agreements will not apply to On-Site Project Work if such provisions are less favorable to this Project than those uniformly required of contractors for construction work normally covered by those agreements; nor shall any provision be recognized or applied on this Project if it may be construed to apply exclusively, or predominantly, to work covered by this Agreement.

C. Any disagreement between signatories to this Agreement over the application to On-Site Project Work of provisions agreed upon in the renegotiation of collective bargaining agreements shall be resolved in accordance with the procedure set forth in Article 9 of this Agreement.

SECTION 2 - LABOR DISPUTES DURING COLLECTIVE BARGAINING AGREEMENT NEGOTIATIONS

The Local Unions agree that there will be no strikes, work stoppages, sympathy actions, picketing, slowdowns or other disruptive activity or other violations of Article 7 affecting the Project by any Local Union involved in the renegotiation of collective bargaining agreements nor shall there be any lock-out on this Project affecting a Local Union during the course of such renegotiations.

ARTICLE 19 – WORKERS' COMPENSATION ADR

All Local Unions, the Contractor and its subcontractors performing On-Site Project Work agree to adopt and be bound by the Alternative Dispute Resolution Agreement entered into between the Construction Industry Council of Westchester and Hudson Valley, Inc. and the Council (herein after referred to as the "Workers' Compensation ADR Agreement").

The Contractor and its subcontractors may provide Workers' Compensation insurance through an alternative insurance carrier (or through self-insurance) or may use an alternative Program Manager, other than the primary carrier or Program Manager designated in Article III, Section 2 of the Workers' Compensation ADR Agreement. The use of an alternative carrier (or self-insurance) and/or Program Manager is subject to approval by the Workers' Compensation ADR Agreement Oversight Committee, which approval shall not be unreasonably withheld.

The determination to utilize the Workers' Compensation ADR Agreement will be at the exclusive option of the County.

SIGNATURES

IN WITNESS WHEREOF the parties have caused this Agreement to be executed and effective as the _____ day of _____, 20___.

BUILDING AND CONSTRUCTION TRADES COUNCIL OF WESTCHESTER AND PUTNAM COUNTIES, NEW YORK, AFL-CIO on behalf of itself and its affiliated Local Unions.

BY:_____ DATE:_____
PRESIDENT

BY:_____ DATE_____
VICE-PRESIDENT

BY:_____ DATE_____
SECRETARY-TREASURER

{INSERT NAME OF CONTRACTOR}

BY:_____ DATE_____
(Name & Title)

APPROVED BY:

COUNTY OF WESTCHESTER

BY:_____ DATE:_____
Commissioner of Public Works and Transportation

Approved as to form:

_____
Sr. Assistant County Attorney
County of Westchester

SCHEDULE "A"

LOCAL COLLECTIVE BARGAINING AGREEMENTS

Below is a list of the affiliate Local Unions of the Building and Construction Trades Council of Westchester and Putnam Counties, New York, AFL-CIO ("Council"). Copies of the applicable Collective Bargaining Agreements of the Local Unions can be obtained by writing to the Building and Construction Trades Council Westchester and Putnam Counties, New York AFL-CIO at 258 Saw Mill River Road, Elmsford, New York 10523, Attn: Edward Doyle, President.

1. Asbestos Workers Local #91 (International Association of Heat and Frost Insulators and Asbestos Workers).
2. Boilermakers Local #5
3. Bricklayers and Allied Craftworkers Local #5 New York
4. Bridge Painters Local 806
5. Dockbuilders Local Union 1456
6. Empire State Regional Council of Carpenters, Reg. 2, Local 11
7. Glaziers Local 1281
8. International Association of Bridge and Structural Ironworkers Local Union 40
9. International Brotherhood of Electrical Workers Local Union 363
10. International Brotherhood of Painters & Allied Trades District Council 9 of New York
11. International Union of Operating Engineers Local 15, 15A, 15B, 15C and 15D
12. International Union of Operating Engineers Local Unions No. 137, 137A, 137B, 137C, 137R
13. Iron Workers District Council of Greater New York and Vicinity
14. IUOE Local No. 30 – Operating Engineers
15. Laborers' International Union of N.A. Local 235 of Westchester and Putnam Counties, New York AFL-CIO
16. Local One International Union of Elevator Constructors of New York and New Jersey – (AFL-CIO)
17. Local Union #3 International Brotherhood of Electrical Workers
18. Metal Polishers Local 8A-28A
19. Metallic Lathers Local No. 46
20. Millwright and Machinery Erectors Local Union No. 740
21. Operative Plasterers' and Cement Masons' International Association Local 530
22. Ornamental Ironworkers Local Union No. 580
23. Plumbers and Steamfitters Local 21
24. Resilient Floor Coverers Local No. 2287

25. Road Sprinkler Fitters Local 669
26. Sheet Metal Workers' International Association Local 137
27. Sheet Metal Workers' Local Union 38
28. Stone Derrickmen and Riggers Local Union No. 197
29. Teamsters Local 813 (Waste Removal)
30. Teamsters Local No. 814 (Moving & Storage)
31. Teamsters Local Union No. 456 (Construction)
32. Tile, Marble & Terrazzo Bricklayers & Allied Craftsmen Local Union No. 7 of New York & New Jersey
33. United Cement Masons' Union of Greater New York and Long Island Local 780
34. United Union of Roofers, Waterproofers and Allied Workers, Local No. 8, New York
35. Westchester Putnam Counties Heavy and Highway Laborers' Local No. 60 L.I.U.N.A.

Not all Local Unions will necessarily be involved in the Project. If it is determined that additional affiliates of the Council are required to be engaged in Project construction work, then the PLA will include those additional affiliates.

TECHNICAL SPECIFICATIONS

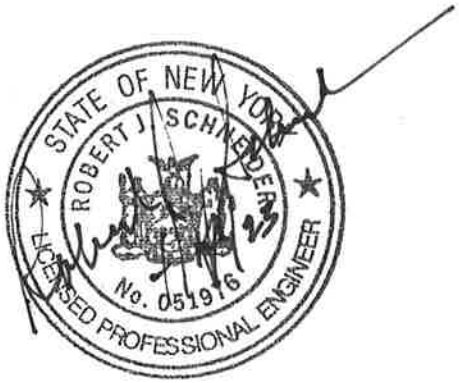
DEPARTMENT OF PUBLIC WORKS AND TRANSPORTATION

Division of Engineering

TECHNICAL SPECIFICATIONS

REHABILITATION OF WEAVER STREET PUMPING STATION
MAMARONECK VALLEY SANITARY SEWER DISTRICT
CONTRACT NO. 22-526
SEALS AND CERTIFICATIONS

ROBERT SCHNEIDER, PE
LICENSE # 051976



The seal and signature to the left applies to the following Specifications Divisions and Sections of this Project Manual:

- **DIVISION 01 – GENERAL REQUIREMENTS**
- **DIVISION 02 – EXISTING CONDITIONS**
- **DIVISION 22 – PLUMBING**
- **DIVISION 31 – EARTHWORKS**
- **DIVISION 32 – EXTERIOR IMPROVEMENTS**
- **SECTION 40 05 05 – EXPOSED PIPING INSTALLATION**
- **SECTION 40 05 06 – COUPLINGS, ADAPTORS, AND SPECIALTIES**
- **SECTION 40 05 07 – PIPE HANGERS AND SUPPORTS**
- **SECTION 40 05 08 – WALL PIPES, FLOOR PIPES, AND PIPE SLEEVES**
- **SECTION 40 05 19 – DUCTILE IRON PROCESS PIPE**
- **SECTION 40 05 31 – THERMOPLASTIC PROCESS PIPE**
- **SECTION 40 05 53 – PROCESS VALVES**
- **SECTION 40 05 76.23 – PIPING SPECIALTIES**
- **SECTION 50 04 93 – COMMON MOTOR REQUIREMENTS**
- **SECTION 41 22 23 – PORTABLE DAVIT CRANES**
- **SECTION 42 21 13.12 – CENTRIFUGAL END SUCTION PUMPS – DRY PIT**
- **SECTION 43 26 23 – STAINLESS STEEL SLIDE GATES**
- **SECTION 46 41 23 – SUBMERSIBLE MIXERS**

TECHNICAL SPECIFICATIONS

REHABILITATION OF WEAVER STREET PUMPING STATION
MAMARONECK VALLEY SANITARY SEWER DISTRICT
CONTRACT NO. 22-526
SEALS AND CERTIFICATIONS

ERROL DAWKINS, AIA **LICENSE # 023835** 	The seal and signature to the left applies to the following Specifications Divisions and Sections of this Project Manual: • **DIVISION 04 – MASONRY** • **DIVISION 07 – THERMAL AND MOISTURE PROTECTION** • **DIVISION 08 – OPENINGS** • **DIVISION 09 – FINISHES** • **DIVISION 10 - SPECIALTIES** •
MRINAL VERMA, PE, **LICENSE # 099849** 	The seal and signature to the left applies to the following Specifications Divisions and Sections of this Project Manual: • **DIVISION 03 – CONCRETE** • **DIVISION 05 – METALS**
VINCENT VITALE, PE **LICENSE # 072448** 	The seal and signature to the left applies to the following Specifications Divisions and Sections of this Project Manual: **DIVISION 23 – HVAC**

TECHNICAL SPECIFICATIONS

REHABILITATION OF WEAVER STREET PUMPING STATION
MAMARONECK VALLEY SANITARY SEWER DISTRICT
CONTRACT NO. 22-526
SEALS AND CERTIFICATIONS

GARRY LYNCH, PE **LICENSE # 055626** 	The seal and signature to the left applies to the following Specifications Divisions and Sections of this Project Manual: • **DIVISION 26 ELECTRICAL**
EDWARD KOWALSKI, PE **LICENSE # 079462** 	The seal and signature to the left applies to the following Specifications Divisions and Sections of this Project Manual: • **SECTION 40 60 05 – INSTRUMENTATION AND CONTROL FOR PROCESS SYSTEMS**

Engineer's seal and signature does not apply to the documents that comprise the General Requirements and Proposals, Information for Bidders, General Clauses, and Sample Forms and Attachments.

It is a violation of applicable laws and regulations governing professional licensing and registration for any person, unless acting under the direction of the licensed and registered design professional(s) indicated above, to alter in any way the Specifications in this Project Manual.

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Not Used

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Not Used

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Not Used

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EXHIBITS

Exhibit A Hazardous Materials Inventory Report for the Fenimore Road, Weaver Street, Archville, and Country Club Lane Pumping Stations

SECTION 01 11 13

SUMMARY OF WORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. This Section includes the following Articles:

Article	Title
1.1	Section Includes
1.2	Location and Description of Work
1.3	Other Construction Contracts
1.4	Work by Others
1.5	Work by OWNER
1.6	Sequence and Progress of Work
1.7	CONTRACTOR's Use of Site
1.8	Easements and Rights-of-Way
1.9	Notices to Owners and Authorities of Properties Adjacent to the Work
1.10	Salvage of Materials and Equipment
1.11	Partial Utilization by OWNER

1.2 LOCATION AND DESCRIPTION OF WORK

A. The Work is located at the:
   1. Weaver Street Pumping Station in Mamaroneck, NY

B. The Work to be performed under this Contract includes, but is not limited to, constructing the Work described below and all related appurtenances. The Work includes, but is not limited to, the following:
   1. Rehabilitation of the existing Weaver Street Pumping Station.
      a. Raising the existing structure and construction of a new structure above the design flood elevation.
      b. Construction of a new Electrical Building to house the electrical power and control systems.
      c. Replacement of the pump, motors, piping, and valves.
      d. Installation of new wet well mixers and controls.
      e. Replacement of concrete pads, dry well platforms and stairs, and railings and rehabilitation of existing concrete.
      f. Replacement of existing fence and gate and repaving.
      g. Replacement of the heating and ventilating equipment.
      h. Replacement of the plumbing systems, including the backflow preventer and dry well sump pump and piping.

i. Replacement of the instrumentation equipment and control panels.
j. Replacement of the electrical equipment and conduit, including lighting, conduit and wire, emergency generator.

C. Contracting Method: The Project shall be constructed under one prime Contract.

D. Hazardous Environmental Conditions:
1. A Hazardous Environmental Condition, described in reports included as exhibits to this Contract will affect the Work.

1.3 OTHER CONSTRUCTION CONTRACTS (NOT USED)

1.4 WORK BY OTHERS

A. Non-Professional Services Contracted by OWNER: OWNER will retain services of the following entities to perform the services indicated relative to the Project. CONTRACTOR shall coordinate and schedule the Work with, and cooperate with, the entities performing the following services for OWNER.
1. Testing and Code-Required Special Inspections:
a. OWNER has, or will, retain the services of a qualified testing laboratory to perform testing and code-required special inspections for the Work, in accordance with Section 01 45 33, Code-Required Special Inspections and Procedures, and selected other provisions of the Contract Documents related to field testing.
2. SCADA Configuration and Integration Services:
a. OWNER has, or will, retain the services of the ENGINEER to perform SCADA configuration services.
3. Control Panel Programming Services:
a. OWNER has, or will, retain the services of the ENGINEER to perform the programming services of each pumping station programmable logic controller (PLC). CONTRACTOR is responsible for providing each PLC control panel, complete, as shown and as specified.

1.5 WORK BY OWNER

A. OWNER will perform the following in connection with the Work:
1. Operate all existing valves, gates, pumps, equipment, and appurtenances that will affect OWNER's operation, unless otherwise specified or indicated.

1.6 SEQUENCE AND PROGRESS OF WORK

A. Requirements for sequencing and coordinating with OWNER's operations, including maintenance of facility operations during construction, and requirements for tie-ins and shutdowns, are in Section 01 14 16, Coordination with Owner's Operations.

1.7 CONTRACTOR'S USE OF SITE

A. CONTRACTOR will have full use of the Site for storage and operations of workers related to the Project.

B. Move stored materials and equipment that interfere with operations of OWNER, other contractors, and others performing work for OWNER.

C. Limits on CONTRACTOR's use of the Site are:
   1. Do not use areas outside the existing property boundary and easement limits for operations.
   2. Refer to the Contract Drawings for limits on the construction laydown and storage areas.
   3. Do not use the Site for operations other than those required for the Project.

1.8 EASEMENTS AND RIGHTS-OF-WAY

A. General:
   1. Easements and rights-of-way required for the permanent improvements included in the Work will be provided by OWNER in accordance with the General Clauses.
   2. Confine construction operations within OWNER's property, public rights-of-way, easements obtained by OWNER, and limits shown, and property for which CONTRACTOR has made arrangements directly with property owner(s).
   3. Use care in placing construction tools, equipment, excavated materials, and materials and equipment to be incorporated into the Work to avoid damaging property and interfering with traffic.
   4. Do not enter private property outside the construction limits without permission from the owner of the property.

B. On Private Property:
   1. General limits of OWNER-furnished easements are shown on the Drawings.
   2. General limits of the OWNER-furnished easements include the access road from Palmer Avenue (Central School) to Weaver Street Pumping Station property, including the parking area directly adjacent to the property.

C. Within Highway and Railroad Rights-of-Way:
   1. Permits required for the permanent facilities will be obtained by OWNER. CONTRACTOR shall obtain and pay for work permits and fees for safety and inspection forces to be furnished by the right-of-way owner.
   2. Work performed and CONTRACTOR's operations within limits of railroad and highway rights-of-way shall comply with requirements of railroad or highway owner and applicable work permits, or authority having jurisdiction over right-of-way.
   3. Comply with Section 01 14 33, Work in Highway Rights-of-Way, and Section 01 41 24, Permit Requirements.

1.9 NOTICES TO OWNERS AND AUTHORITIES OF PROPERTIES ADJACENT TO THE WORK

A. Notify owners of adjacent property and utility owners when prosecution of the Work may affect their property, facilities, or use of property.

B. When it is necessary to temporarily obstruct access to property, or when utility service connection will be interrupted, provide notices sufficiently in advance to enable affected persons to provide for their needs. Such notifications shall comply with Laws and Regulations and, whether delivered orally or in writing, shall include appropriate information concerning the interruption and instructions on how to limit inconvenience caused thereby.

C. Notify utility owners and other concerned entities not less than 48 hours prior to cutting or closing streets or other traffic areas or excavating near Underground Facilities or exposed utilities.

1.10 SALVAGE OF MATERIALS AND EQUIPMENT

A. OWNER has first right of refusal for equipment and materials removed from the facility. CONTRACTOR shall include the removal and disposal of all items within the appropriate lump sum, regardless if they have been flagged for salvage.

B. Existing materials and equipment removed and not shown or specified to be reused in the Work will become CONTRACTOR's property, except the following items that shall remain OWNER's property:
   1. RACO auto-dialer system.
   2. PLC Control Panel components (e.g. I/O cards).

C. Existing materials and equipment removed by CONTRACTOR shall not be reused in the Work, except for the following:
   1. Emergency Generator – The emergency generator may be utilized by the CONTRACTOR to provide temporary emergency backup power to utility power only as needed to maintain operation of the pumping station or temporary pumping system during construction. If used, CONTRACTOR assumes all ownership, maintenance, labor, and fuels required for operation.

D. Removal, Storage, Handling, Reinstallation:
   1. Carefully remove in manner to prevent damage all materials and equipment shown or indicated to be salvaged and reused or to remain property of OWNER.
   2. Store and protect salvaged items shown or indicated to be used in the Work.
   3. Replace in-kind or with new items those items of materials and equipment damaged during removal, storage, or handling through CONTRACTOR's actions, negligence, or improper procedures.

E. CONTRACTOR may furnish and install new items, with ENGINEER's approval, instead of those specified or indicated to be salvaged and reused, in which case such removed items will become CONTRACTOR's property.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 13 13

SCHEDULE OF COMPLETION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, tools, and incidentals required to perform the Work in accordance with the Contract Times provisions of the Contract Documents.
   2. This Section is not intended to describe all the Work or its constraints, interrelationships, or sequential requirements required.

1.2 CONTRACT TIMES

A. The work performed under this contract shall meet the milestones dates specified in Table 01 13 13-A, SCHEDULE OF COMPLETION, given below:

TABLE 01 13 13-A
SCHEDULE OF COMPLETION

Building/Area	Milestone	Contract Time
Shop Drawings	Submission to Engineer of all Shop Drawings required for all work in this Contract	90 calendar days from Notice to Proceed.
All Contract Work	Complete all Contract Work and Project Closeout	560 calendar days from Notice to Proceed.

B. In order to achieve the above listed schedule, the CONTRACTOR shall submit for approval and procure long lead items so as to minimize the time between completion of preparation work for equipment installation and equipment delivery to the site.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 14 16

COORDINATION WITH OWNER'S OPERATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for coordinating with OWNER's operations during the Project, and includes requirements for tie-ins and shutdowns necessary to complete the Work without impact on OWNER's operations except as allowed in this Section.
   2. CONTRACTOR shall provide all labor, materials, equipment, tools, and incidentals shown, specified, and required to coordinate with OWNER's operations during the Work in accordance with this Section.
   3. "OWNER" used herein refers to the Westchester County Department of Environmental Facilities that owns and operates the Weaver Street Pumping Station.

B. Coordination:
   1. Review construction procedures under other Specifications sections and coordinate Work that will be performed with or before the Work specified in this Section.

C. Related Sections:
   1. Section 01 11 13, Summary of Work.
   2. Section 01 51 41, Temporary Pumping.
   3. Section 01 73 29, Cutting and Patching.
   4. Section 01 73 24, Connections to Existing Facilities.

D. Except for shutdowns specified in this Section, perform the Work such that OWNER's facilities remain in continuous satisfactory operation during the Project. Schedule and conduct the Work such that the Work does not: impede OWNER's production or processes, create potential hazards to operating equipment and personnel, reduce the quality of the facility's products or effluent, cause odors or other nuisances, or affect the public health, safety, and convenience.

E. Work not specifically covered in this Section or in referenced Sections may, in general, be completed, at any time during regular working hours in accordance with the Contract Documents, subject to the requirements in this Section.

F. As a substitute to the procedures specified in this Section, CONTRACTOR may propose providing additional temporary facilities that can eliminate or mitigate a constraint without additional cost to OWNER, provided such additional temporary facilities: do not present hazards to the public, personnel, structures, and equipment; that such additional temporary facilities do not adversely affect

OWNER's ability to comply with Laws and Regulations, permits, and operating requirements; that such temporary facilities do not generate or foster the generation of odors and other nuisances; and that requirements of the Contract Documents are fulfilled.

G. Coordinate shutdowns with OWNER and ENGINEER. When possible, combine multiple tie-ins into a single shutdown to reduce impacts on OWNER's operations and processes.

H. Operation of Existing Systems and Equipment during the Work:
   1. Do not shut off or disconnect existing operating systems or equipment, unless accepted by ENGINEER in writing.
   2. Operation of existing systems and equipment will be by OWNER unless otherwise specified or indicated.
   3. Where necessary for the Work, CONTRACTOR shall seal or bulkhead OWNER-operated gates and valves to prevent leakage that may affect the Work, OWNER's operations, or both.
   4. Provide temporary watertight plugs, bulkheads, and line stops as required. After completing the Work, remove seals, plugs, bulkhead, and line stops to satisfaction of ENGINEER.

I. Bypassing:
   1. CONTRACTOR shall provide diversion of flows around the existing pumping stations to perform the Work.
   2. Requirements for temporary pumping are in Section 01 51 41, Temporary Pumping and shown or indicated on the Drawings. Requirements for temporary pumping associated with specific shutdowns are indicated in this Section.
   3. Provide line stops and tapping sleeves and valves on the existing force mains at Weaver Street Pumping Stations as needed to facilitate the Work and temporary pumping operations.

1.2 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Substitute Sequence Submittal: When deviation from specified sequence or procedures is proposed, furnish submittal explaining in detail the proposed sequence or procedures and associated effects, including evidence that OWNER's operations will not be adversely affected, to an extent greater than originally contemplated in the Contract Documents, by proposed substitution. List benefits of proposed substitution, including benefits to Progress Schedule. Submit in accordance with the General Clauses, and other requirements of the Contract Documents regarding substitution requests.

B. Informational Submittals: Submit the following:
   1. Shutdown Planning Submittal:

a. For each shutdown, submit an inventory of labor, materials, and equipment required to perform the shutdown and tie-in tasks, an estimate of time required to accomplish the complete shutdown including time for OWNER to take down and start up existing equipment, systems, or conduits, and written description of steps required to complete the Work associated with the shutdown.
b. Furnish submittal to ENGINEER not less than 30 days prior to proposed shutdown start date. Do not start shutdown until obtaining ENGINEER's acceptance of shutdown planning submittal.

2. Shutdown Notification: After ENGINEER's acceptance of shutdown planning submittal and prior to starting the shutdown, submit written notification to OWNER and ENGINEER of date and time each shutdown is to start. Submit notification not less than 7 days in advance of each shutdown.

1.3 GENERAL CONSTRAINTS

A. Indicated in the Contract Documents are the sequence and shutdown durations, where applicable, for OWNER'S equipment, systems, and conduits (including piping and ducting) that are to be taken out of service temporarily for the Work. New materials, equipment, and systems may be used by OWNER after the specified field quality controls and testing are successfully completed and the materials or equipment are Substantially Complete in accordance with the Contract Documents.

B. The following constraints apply to coordination with OWNER's operations:
1. Operational Access: OWNER'S personnel shall have access to equipment and areas of the facility that remain in operation.
2. Temporary Partitions and Enclosures: Provide temporary partitions and enclosures necessary to maintain dust-free, heated, and ventilated spaces in areas of the facility that are adjacent to the Work and that must be kept operational. Comply with Section 01 51 05, Temporary Utilities.
3. Schedule and perform equipment and system start-ups for Monday through Thursday. Equipment and systems shall not be placed into operation on Friday, Saturday, and Sunday without prior approval of OWNER, unless specifically indicated otherwise in the Contract Documents.
4. Dead End Valves or Conduits: Provide blind flanges, watertight bulkheads, or valve at temporary and permanent terminuses of conduits, including piping and ducting. Blind flanges and bulkheads shall be suitable for the service and braced and blocked, as required, or otherwise restrained as directed by ENGINEER. Temporary valves shall be suitable for their associated service. Where valve is provided at permanent terminus of conduit, including piping or ducting, also provide on downstream side of valve a blind flange with minimum 1-1/2-inch drain/flushing connection.
5. Draining and Cleaning of Wet Wells, Manholes, Dry Wells and Piping:
a. Unless otherwise shown or indicated, CONTRACTOR shall dewater manholes, wet wells, and piping , and dry wells at beginning of each

shutdown. Flush, wash down, and clean wet wells, manholes, tanks, basins, conduits (including piping), and other work areas.

b. CONTRACTOR shall remove liquids and solids and dispose of them at appropriate location at the Site as directed by ENGINEER. Unless otherwise specified or indicated, contents of manholes, wet wells, conduits (including piping), and dry wells undergoing modifications shall be transferred to existing process tanks or conduits at the Site with capacity sufficient to accept such discharges, using hoses, temporary piping, temporary pumps, or other means provided by CONTRACTOR. Discharge of fluids across floors is not allowed.

c. If drainage point is not available on the conduit (including piping) to be drained, provide a wet tap using tapping saddle and valve or other method approved by ENGINEER. Uncontrolled spillage of contents of conduits (including piping) is not allowed.

d. Spillage shall be brought to ENGINEER's attention immediately, both verbally and in writing, and reported in accordance with Laws and Regulations. CONTRACTOR shall wash down spillage to floor drains or sumps or other appropriate location and flush the system to prevent clogging and odors. If spillage is not suitable for discharge to the drainage system, such as chemical spills, as determined by ENGINEER, CONTRACTOR shall remove spillage by other method, such as vactor or vacuum truck, sorbents, or other method acceptable to ENGINEER.

1.4 SEQUENCE OF WORK

A. Perform the Work in the indicated sequence. Certain phases or stages of the Work may require working 24-hour days or work during hours outside of regular working hours. Work may be accelerated from a later stage to an earlier stage if OWNER's operations are not adversely affected by proposed sequence change, with ENGINEER's acceptance. Stages specified in this Article 1.4 are sequence-dependent.

B. Stage I: Site Preparation
   1. Prepare staging area with temporary fencing and erosion and sedimentation control measures.
   2. Relocate existing County mobile trailer and generator, if selected, and provide temporary electrical service, utilities, and pumping systems.

C. Stage II: Construct Raised Pumping Station
   1. Perform demolition, site, and structural work required to raise the existing pumping station, construct the new elevated platform, and construct the new Electrical Building.
   2. CONTRACTOR is responsible for providing continued operation of the pumping station either by maintaining existing pumping equipment or providing temporary pumping during this time.

D. Stage III: Replace Pumping Station Equipment
   1. Perform demolition, architectural, structural, mechanical, plumbing, HVAC, electrical, and instrumentation work required to replace the pumping station systems as indicated.
   2. CONTRACTOR is responsible for providing continued operation of the pumping station either by maintaining existing pumping equipment or providing temporary pumping during this time.

E. Stage IV: Restoration
   1. Perform site restoration.

1.5 TIE-INS

A. CONTRACTOR shall perform tie-ins required to complete the Work as shown the Contract Drawings or as required to complete the Work.

1.6 SHUTDOWNS

A. General:
   1. Terminology: A "shutdown" is when a portion of the normal operation of OWNER's facility, whether equipment, systems, conduit (including piping and ducting), has to be temporarily suspended or taken out of service to perform the Work.
   2. Work that may interrupt normal operations shall be accomplished at times convenient to OWNER unless otherwise indicated in the Contract Documents.
   3. Furnish at the Site, in close proximity to the shutdown and tie-in work areas, tools, materials, equipment, spare parts, both temporary and permanent, necessary to successfully perform the shutdown. Complete to the extent possible, prefabrication of piping and other assemblies prior to commencing the associated shutdown. Demonstrate to ENGINEER's satisfaction that CONTRACTOR has complied with such requirements before commencing the shutdown.
   4. If CONTRACTOR's operations cause an unscheduled interruption of OWNER's operations, immediately re-establish satisfactory operation for OWNER.
   5. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of OWNER's facilities that result in fines or penalties by authorities having jurisdiction shall be paid solely by CONTRACTOR if, in ENGINEER's opinion, CONTRACTOR did not comply with requirements of the Contract Documents, or was negligent in the Work, or did not exercise proper precautions in performing the Work and complying with applicable permits, Laws, and Regulations.
   6. Work requiring service interruptions for tie-ins shall be performed during scheduled shutdowns.

B. Shutdowns of Electrical Systems:
   1. Comply with Laws and Regulations, including the National Electric Code.
   2. CONTRACTOR shall lock out and tag circuit breakers and switches operated by OWNER and shall verify that affected cables and wires are de-energized to ground potential before shutdown Work is started.
   3. Upon completion of shutdown Work, remove the locks and tags and notify ENGINEER that facilities are available for use.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 GENERAL

A. In addition to requirements of this Section, comply with Section 01 51 41, Temporary Pumping, Section 01 73 29, Cutting and Patching, and Section 01 73 24, Connections to Existing Facilities, and other Contract Documents applicable to Work associated with shutdowns, tie-ins, temporary pumping (where applicable), and similar work.

+ + END OF SECTION + +

SECTION 01 22 13

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Items listed starting in Article 1.4 of this Section refer to and are the same pay items listed in the Proposal Page and constitute all pay items for completing the Work.
   2. No direct or separate payment will be made for providing miscellaneous temporary or accessory works, plant or facility services, CONTRACTOR's or ENGINEER's field offices, layout surveys, Project signs, sanitary requirements, testing, safety provisions and safety devices, submittals and record drawings, water supplies, power and fuel, maintenance of traffic, removal of waste, security, coordination with OWNER's operations, information technology (including hardware, software, and services) required during construction, commissioning where specified, bonds, insurance, or other requirements of the General Clauses, Division 01 Specifications, and other requirements of the Contract Documents.
   3. Compensation for all services, items, materials, and equipment shall be included in prices stipulated for lump sum and unit price pay items listed in this Section and included in the Contract.

B. Each lump sum and unit price, as bid, shall include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

1.2 ENGINEER'S ESTIMATE OF QUANTITIES

A. ENGINEER's estimated quantities for items of Unit Price Work, as included in the Contract, are approximate only and are included solely for purpose of comparing Bids and pricing. OWNER does not expressly or by implication agree that nature of materials encountered below the ground surface or actual quantities of material encountered or required will correspond with the quantities included in the Contract at the time of award and reserves the right to increase or decrease quantities, and to eliminate quantities, as OWNER may deem necessary.

B. CONTRACTOR and OWNER will not be entitled to adjustment in unit prices as a result of change in estimated quantity and agree to accept the unit prices accepted in the Bid as complete and total compensation for additions or deletions caused by changes or alterations in the Unit Price Work directed by OWNER.

1.3 RELATED PROVISIONS

A. Payments to CONTRACTOR: Refer to Information for Bidders, General Clauses, Agreement.

B. Changes in Contract Price: Refer to Information for Bidders and General Clauses.

C. Schedule of Values: Refer to Section 01 29 73, Schedule of Values.

1.4 GENERAL CONTRACT BID ITEMS (REQUIRED ITEMS)

A. Item 1 – Restoration Work:
   1. Measurement and Payment: Lump sum payment for Item 1 will be full compensation for completing the Work for providing all labor, materials, and equipment necessary to complete the following Work as shown on the Contract Drawings and specified under Divisions 01 through Division 46.
      a. Replace the wastewater pumps.
      b. Replace the wastewater pump starters.
      c. Replace the interior pump suction piping, valves, and appurtenances.
      d. Replace the interior pump discharge piping, valves, and appurtenances.
      e. Replace the sump pump in the dry well and discharge piping, valves, and appurtenances.
      f. Replace the backflow preventer.
      g. Replace the Pump Station Control Panel, inclusive of the network switch and uninterruptible power supply (UPS).
      h. Replace the Network Cabinet.
      i. Replace the Auto-Dialer Panel.
      j. Relace the Backup Float Panel and backup floats.
      k. Replace the bubbler system.
      l. Replace the hazardous gas detection system in the wet well.
      m. Replace the pump pressure gauges.
      n. Replace the flow meter on the discharge header and chart recorder.
      o. Replace the pressure transmitter on the discharge header.
      p. Replace the float detection switch in the dry well.
      q. Replace the dry well ventilation system, inclusive of supply fan, supply hood, relief hood, ductwork, controls, and appurtenances.
      r. Replace the wet well ventilation system, inclusive of supply fan, supply hood, gooseneck vent, ductwork, controls, and appurtenances.
      s. Replace the electric unit heaters in the dry well.
      t. Replace the electrical service meter and main disconnect switch.
      u. Replace the 400 amp, 120/208 V, 3 phase panelboard (PP-WVR).
      v. Replace the diesel generator, sound attenuating enclosure, and belly fuel tank.
      w. Replace the automatic transfer switch.
      x. Replace the lighting in the dry well.
      y. Replace the lighting in the wet well.
      z. Provide temporary electrical systems and temporary pumping systems required to facilitate construction.

aa. Include all incidental Work, including but not limited to, conduit, wiring, disconnects, starters, junction boxes, receptacles, pull boxes, concrete bases, and accessories, to perform the items listed above.

B. Item 2 –Mitigation Work:

1. Measurement and Payment: Lump sum payment for Item 2 will be full compensation for completing the Work for providing all labor, materials, and equipment necessary to complete the following Work as shown on the Contract Drawings and specified under Divisions 01 through Division 46:

a. Excavation, fill, and removal of existing abandoned sewer piping required for the to raise the existing pumping station structure and construct the elevated concrete deck for the Electrical Building and standby generator.
b. Raise the influent manhole and replace with watertight cover.
c. Provide new utility pole and coordinate relocation of overhead telecommunication wires to the Central School.
d. Provide drilled concrete piles to support the elevated concrete deck for the Electrical Building and standby generator.
e. Demolish the existing pumping station top slab and walls.
f. Raise the existing pumping station walls and provide new top slab, including metal access hatches.
g. Provide new elevated concrete deck for the Electrical Building and standby generator.
h. Provide architectural and structural work for new Electrical Building.
i. Provide new access stairs, platforms, and railings for new raised structure.
j. Replace ships ladders, platforms, framing, and railings in the dry well.
k. Replace ships ladders, platforms, framing, and railings in the wet well.
l. Provide electric unit heater in the Electrical Room.
m. Provide air conditioning unit in the Electrical Room.
n. Demolish the existing backflow preventer vault.
o. Provide new curb stop and water valve box on existing water service and provide new water piping, supports, and appurtenances to the new backflow preventer.
p. Provide a heated enclosure for water meter (Included in Item 3) and backflow preventer (included in Item 1).
q. Provide hatch drainage piping.
r. Replace the underground secondary electrical service and telecommunication service from the offsite utility pole to the pumping station, including the ductbanks, manholes, and pull boxes.
s. Provide the 125 amp, 120/208 V, 3 phase panelboard (LP-WVR).
t. Provide grounding for the pumping station and Electrical Building.
u. Provide lighting atop of raised structure.
v. Provide lighting in the Electrical Room.
w. Provide the intrusion detection switch on the Electrical Building door.

x. Include all incidental Work, including but not limited to, conduit, wiring, disconnects, starters, junction boxes, receptacles, pull boxes, concrete bases, and accessories, to perform the items listed above.

C. Item 3 – All Other Work:
   1. Measurement and Payment: Lump sum payment for Item 3 will be full compensation for completing the Work for providing all labor, materials, and equipment necessary to complete the following Work as shown on the Contract Drawings and specified under Divisions 01 through Division 46:
      a. Replace the perimeter fencing and manual sliding gate.
      b. Replace pavement and curbs within fence line and provide all pavement restoration in the staging area.
      c. Replace the manual bar rack in the wet well.
      d. Replace the slide gates and operators in the wet well.
      e. Provide submersible mixers in the wet well.
      f. Provide 8-inch suction bypass piping in the wet well.
      g. 8-inch discharge piping and isolation valve in the dry well.
      h. Replace the davit crane atop the wet well.
      i. Provide submersible pressure transducers.
      j. Provide intrusion detection switches on the metal access hatches.
      k. Demolish abandoned electrical cabinets within the dry well.
      l. Replace the manual transfer switch.
      m. Provide the portable generator connection.
      n. Provide Fire Alarm Relay Panel and heat detectors and smoke detector.
      o. Provide the Dry Well Ventilation Alarm Relay Cabinet and related alarm lighting and horn in the pumping station.
      p. Provide the Wet Well Gas Detection Alarm Relay Cabinet and related alarm lighting and horn within the pumping station.
      q. Provide emergency lighting in the dry well and wet well.
      r. Replace the water utility meter as shown on the Plumbing Drawings.
      s. Provide non-potable water piping downstream of the backflow preventer and hose bibbs in the pumping station structure.
      t. Provide temporary construction fencing, trailers, and erosion and sediment control measures.
      u. Include all incidental Work, including but not limited to, conduit, wiring, disconnects, starters, junction boxes, receptacles, pull boxes, concrete bases, and accessories, to perform the items listed above.
      v. Include all Work not specifically called out in other Items.

D. Item 4 – Typical Concrete Surface Repair – Type 1:
   1. Measurement: Quantity of typical concrete surface repair that will be paid under this item will be the computed surface area completed as shown, indicated, or directed by ENGINEER.
   2. Payment: Unit price per square foot for Item 4 will be full compensation for all typical concrete surface repair, complete as directed by ENGINEER, and not specifically included under other items or contracts.

E. Item 5 – Non Structural Crack Repair – Type 2:
   1. Measurement: Quantity of non-structural crack repair that will be paid under this item will be the computed linear footage completed as shown, indicated, or directed by ENGINEER.
   2. Payment: Unit price per linear foot for Item 5 will be full compensation for all non-structural crack repair, complete as directed by ENGINEER, and not specifically included under other items or contracts.

F. Item 6 – Structural Crack Repair – Type 3:
   1. Measurement: Quantity of structural crack repair that will be paid under this item will be the computed linear footage completed as shown, indicated, or directed by ENGINEER.
   2. Payment: Unit price per linear foot for Item 6 will be full compensation for all structural crack repair, complete as directed by ENGINEER, and not specifically included under other items or contracts

G. Item 7 – Typical Exposed Aggregate Repair – Type 4:
   1. Measurement: Quantity of typical exposed aggregate repair that will be paid under this item will be the computed surface area completed as shown, indicated, or directed by ENGINEER.
   2. Payment: Unit price per square foot for Item 7 will be full compensation for all typical exposed aggregate repair, complete as directed by ENGINEER, and not specifically included under other items or contracts

H. Item 8 – Typical Expansion Joint Repair – Type 4:
   1. Measurement: Quantity of typical expansion joint repair that will be paid under this item will be the computed linear footage completed as shown, indicated, or directed by ENGINEER.
   2. Payment: Unit price per linear foot for Item 8 will be full compensation for all typical expansion joint repair, complete as directed by ENGINEER, and not specifically included under other items or contracts

I. Item W699.02001 – Mobilization:
   1. Measurement: There will be no measurement for Item W699.020001, Mobilization, as this will be paid on a lump sum basis. The cost of mobilization shall not exceed two percent of the Contract Price, excluding this Item, Item W699.040002 Contract Bonds and Insurance and Item W800 Miscellaneous Additional Work.
   2. Payment for Item W699.020001, Mobilization, will be made at the lump sum price bid. This price and payment shall be full compensation for all costs associated with initiating and completing the Contract, exclusive of the cost of materials. Payment shall include compensation for all preliminary and organizational bidding expenses; moving materials and equipment onto the jobsite; project signs; pre-construction surveys; site preparation, including establishing Contractor's Field Sheds and Engineer's Field Office, installation of temporary construction fencing and of siltation and erosion control measures

as shown on the drawings; and the general costs associated with establishing the Work on site to assure that it is proceeding in a continuous manner.

J. Item W699.020002 – Contract Bonds and Insurance:
   1. Measurement: There will be no measurement for Item W699.020002, Contract Bonds and Insurance, as this will be paid on a lump sum basis. The cost of Contract Bonds and Insurance shall not exceed three percent of the Contract Price, excluding this Item, Item W699.040001 Mobilization and Item W800 Miscellaneous Additional Work.
   2. Payment: Payment for Item W699.020002, Contract Bonds and Insurance, will be made at the lump sum price bid. This price and payment shall be full compensation for all costs associated with initiating and completing the Contract. Payment shall include compensation for all Contracts, Bonds and Insurance obtained by the Contractor to perform the Work as indicated in the Contract Documents. The amount bid shall be payable with the first contract payment.

K. Item W800 – Miscellaneous Additional Work:
   1. Measurement: Under this item the CONTRACTOR shall furnish all labor, material and equipment required to accomplish miscellaneous additional work as ordered by the ENGINEER and approved by the OWNER .
   2. Payment: Payment for Work authorized under Item W800 will be full compensation for providing all Work authorized under the miscellaneous work allowance, complete as specified or directed by ENGINEER. Work authorized under the miscellaneous work allowance may be included in subsequent Application(s) for Payment, as applicable, following authorization and performance of contingency allowance Work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 26 00

CONTRACT CLARIFICATION PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope.
   1. This Section expands upon provisions of the General Clauses and includes:
      a. Requests for interpretation.
      b. Clarification notices.
      c. Proposal requests.
      d. Miscellaneous Additional Work proposals.
      e. Miscellaneous Additional Work.

B. Submit Contract clarification documents in accordance with Article 44, "Shop Drawings," of the General Clauses.

C. Retain at Contractor's office and at the Site complete copy of each Contract clarification document and related documents, and Engineer's response.

1.2 REQUESTS FOR INTERPRETATION

A. General.
   1. Submit written requests for interpretation to Engineer. Contractor and Owner may submit requests for interpretation.
   2. Submit request for interpretation to obtain clarification or interpretation of the Contract Documents. Report conflicts, errors, ambiguities, and discrepancies in the Contract Documents using requests for interpretation.
   3. Do not submit request for interpretation when other form of communication is appropriate, such as submittals, requests for substitutions or "or equals," notices, ordinary correspondence, or other form of communication. Improperly prepared or inappropriate requests for interpretation will be returned without response or action.

B. Procedure.
   1. Submit one original and two copies of each request for interpretation. Submit each request for interpretation with separate letter of transmittal.
   2. Engineer will provide timely review of requests for interpretation. Allow sufficient time for review and response.
   3. Engineer will maintain log of requests for interpretation. Copy of log will be provided upon request.
   4. Engineer will provide written response to each request for interpretation. One copy of Engineer's response will be distributed to:
      a. Contractor.

b. Owner.
c. Construction Administrator.
d. Engineer.

5. If Engineer requests additional information to make an interpretation, provide information requested within ten days, unless Engineer allows additional time, via correspondence referring to request for interpretation number.
6. If Contractor or Owner believes that a change in the Contract Price or Contract Times or other change to the Contract is required, notify Engineer in writing before proceeding with the Work associated with the request for interpretation.

C. Submit each request for interpretation on the request for interpretation form included with this Section, or other form acceptable to Engineer.
1. Number each request for interpretation as follows: Numbering system shall be the Contract number and designation followed by a hyphen and three-digit sequential number. Example: First request for interpretation on the general contract for project titled, "Contract 22-526" would be, "RFI No. 22-526-GC-001".
2. In space provided on form, describe the interpretation requested. Provide additional sheets as necessary. Include text and sketches as required in sufficient detail for Engineer's response.
3. When applicable, request for interpretation shall include Contractor's recommended resolution.

1.3 CLARIFICATION NOTICES

A. General:
1. Clarification notices, when required, will be initiated and issued by Engineer.
2. Clarification notices do not change the Contract Price or Contract Times, and do not alter the Contract Documents.
3. Clarification notices will be issued as correspondence or using clarification notice form, with additional information as required.

B. Procedure.
1. One copy of each written clarification notice will be distributed to:
a. Contractor.
b. Owner.
c. Construction Administrator.
d. Engineer.
2. If Contractor or Owner believes that a change in the Contract Price or the Contract Times or other change to the Contract is required, notify Engineer in writing before proceeding with the Work associated with clarification notice.
3. If clarification notice is unclear, submit request for interpretation.

1.4 PROPOSAL REQUESTS

A. General:
   1. Proposal requests may be initiated by Engineer or Owner.
   2. Proposal requests are for requesting the effect on the Contract Price and the Contract Times and other information relative to contemplated changes in the Work. Proposal requests do not authorize changes or variations in the Work, and do not change the Contract Price or Contract Times or terms of the Contract.
   3. Proposal requests will be furnished using the proposal request form included with this Section.

B. Procedure.
   1. One copy of each signed proposal request will be furnished to Contractor with one copy each to:
      a. Owner.
      b. Construction Administrator.
      c. Engineer.
   2. Submit request for interpretation to clarify conflicts, errors, ambiguities, and discrepancies in proposal request.
   3. Upon receipt of proposal request, Contractor shall prepare and submit a Miscellaneous Additional Work proposal, in accordance with this Section, for the proposed Work described in the proposal request.

1.5 MISCELLANEOUS ADDITIONAL WORK PROPOSALS

A. General.
   1. Submit written Miscellaneous Additional Work proposal to Engineer in response to each proposal request, and when Contractor believes a change in the Contract Price or Contract Times or other change to the terms of the Contract is required.

B. Procedure.
   1. Submit to Engineer one original and two copies of each Miscellaneous Additional Work proposal with accompanying documentation, and simultaneously submit two copies to Owner. Submit each Miscellaneous Additional Work proposal with separate letter of transmittal.
   2. Engineer will review Miscellaneous Additional Work proposal and either request additional information from Contractor or provide to Owner recommendation regarding approval of the Miscellaneous Additional Work proposal.
   3. When Engineer requests additional information to render a decision, submit required information within five days of receipt of Engineer's request, unless Engineer allows more time. Submit the required information via correspondence that refers to Miscellaneous Additional Work proposal number.
   4. Upon completing review, one copy of Engineer's written response, if any, will be distributed to:

a. Contractor.
b. Owner.
c. Construction Administrator.
d. Engineer.

5. If Miscellaneous Additional Work proposal is recommended for approval by Engineer and approved by Owner, Miscellaneous Additional Work will be authorized.
6. If parties do not agree on terms for the change, Owner or Contractor may file a Claim against the other, in accordance with the General Clauses.

C. Each Miscellaneous Additional Work proposal shall be submitted on the Miscellaneous Additional Work proposal form included with this Section, or other form acceptable to Engineer.
   1. Number each Miscellaneous Additional Work proposal as follows: Numbering system shall be the Contract number and designation followed by a hyphen and three-digit sequential number. Example: First Miscellaneous Additional Work proposal for the general contract for project named "Contract MP15" would be, "Proposal No. MP15-GC-001".
   2. In space provided on form:
      a. Describe scope of each proposed change. Include text and sketches on additional sheets as required to provide detail sufficient for Engineer's review and response. If a change item is submitted in response to proposal request, write in as scope, "In accordance with Proposal Request No." followed by the proposal request number. Provide written clarifications, if any, to scope of change.
      b. Provide justification for each proposed change. If change is in response to proposal request, write in as justification, "In accordance with Proposal Request No." followed by the proposal request number.
      c. List the total change in the Contract Price and Contract Times for each proposed change.
   3. Unless otherwise directed by Engineer, attach to the Miscellaneous Additional Work proposal detailed breakdowns of pricing (Cost of the Work and Contractor's fee) including:
      a. List of Work tasks to accomplish the change.
      b. For each task, labor cost breakdown including labor classification, total hours per labor classification, and hourly cost rate for each labor classification.
      c. Construction equipment and machinery to be used, including manufacturer, model, and year of manufacture, and number of hours for each.
      d. Detailed breakdown of materials and equipment to be incorporated into the Work, including quantities, unit costs, and total cost, with Supplier's written quotations.
      e. Breakdowns of the Cost of the Work and fee for Subcontractors, including labor, construction equipment and machinery, and materials and equipment incorporated into the Work, other costs, and Subcontractor fees.

f. Breakdown of other costs eligible, in accordance with the General Clauses.
g. Other information required by Engineer.
h. Contractor's fees applied to eligible Contractor costs and eligible Subcontractor costs.

1.6 MISCELLANEOUS ADDITIONAL WORK

A. General:
1. Miscellaneous Additional Work will be recommended by Engineer and signed by Owner and Contractor, to authorize additions, deletions, or revisions to the Work, or changes to the Contract Price or Contract Times.
2. Miscellaneous Additional Work instructions will be of a form acceptable to the Construction Administrator.

B. Procedure.
1. Three originals of each Miscellaneous Additional Work instruction will be furnished to Contractor, who shall sign each original Miscellaneous Additional Work instruction and return all originals to Engineer within five days of receipt.
2. Engineer will sign each original Miscellaneous Additional Work instruction and forward them to Owner.
3. After approval and signature by Owner, original Miscellaneous Additional Work instructions will be distributed as follows:
a. Contractor: One original.
b. Owner: One original.
c. Engineer: One original.
4. One copy of each Miscellaneous Additional Work instruction will be distributed to:
a. Construction Administrator.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 ATTACHMENTS

A. The forms listed below, following the "End of Section" designation, are part of this Specification Section:
   1. Request for Interpretation form (one page).
   2. Proposal Request form (one page).
   3. Miscellaneous Additional Work Proposal form (one page).

+ + END OF SECTION + +

WESTCHESTER COUNTY, NY
PUMPING STATION REHABILITATION,
WEAVER STREET PUMPING STATION
CONTRACT NO. 21-XXX

REQUEST FOR INTERPRETATION

Contractor: _____ RFI No. _____
Date Transmitted: _____ Date Received: _____
Date Response Requested: _____ Date Response Transmitted: _____

Subject: _____
Specification Section and Paragraph: _____
_____
Drawing References: _____

INTERPRETATION REQUESTED:

Signature: _____ Date: _____

ENGINEER'S RESPONSE:

Signature: _____ Date: _____

WESTCHESTER COUNTY, NY
PUMPING STATION REHABILITATION,
WEAVER STREET PUMPING STATION
CONTRACT NO. 21-XXX

PROPOSAL REQUEST

Proposal Request No.: _____ Date: _____

Contract Name and No.: _____

Contractor: _____

Other Contracts Involved in Proposed Change: _____
_____

TO CONTRACTOR: Please submit a complete Miscellaneous Additional Work proposal for the proposed modifications described below. If the associated Miscellaneous Additional Work proposal is approved, Miscellaneous Additional Work instructions will be issued to authorize adjustment so the scope of the Work. This Proposal Request is not Miscellaneous Additional Work, or an authorization to proceed with the proposed Work described below.

SCOPE OF PROPOSED WORK:

1. *Item*:
2. *Item*:
3. *Item*:

Proposal Requested By: _____

Signature of Requestor: _____

WESTCHESTER COUNTY, NY
PUMPING STATION REHABILITATION,
WEAVER STREET PUMPING STATION
CONTRACT NO. 21-XXX

MISCELLANEOUS ADDITIONAL WORK PROPOSAL

Miscellaneous Additional Work Proposal No.: _____ Date: _____

Submitted in Response to Proposal Request No.: _____

Contract Name and No.: _____

Contractor: _____

Subject: _____
_____

The following changes to the Contract are proposed:

SCOPE OF WORK: *(attach and list supporting information as required)*

1. *Item*:
2. *Item*:

JUSTIFICATION:

1. *Item*:
2. *Item*:

CHANGES IN CONTRACT PRICE AND CONTRACT TIMES:

We propose that the Contract Price and Contract Times be changed as follows:

For Contract Price, when requested by Engineer, attach detailed cost breakdowns for Contractor and Subcontractors, Supplier quotations, and other information required.

For the Contract Times, state increase, decrease, or no change to Contract Times for Substantial Completion, readiness for final payment, and Milestones, if any. If increase or decrease, state specific number of days for changes to the Contract Times.

Description	Amount	Contract Times (days)	
		Substantial	Final
1. Item	$0.00	0	0
2. Item	$0.00	0	0
Total This Miscellaneous Additional Work Proposal	*$0.00*	*0*	*0*

Changes to Milestones, if any: _____

The adjustment proposed is the entire adjustment to the Contract to which the proposer believes it is entitled as a result of the proposed change.

Miscellaneous Additional Work Proposal By: _____

Signature of Proposer: _____

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SECTION 01 29 73

SCHEDULE OF VALUES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall prepare and submit to ENGINEER for acceptance a Schedule of Values that allocates cost to each item of the Work. Schedule of Value list of line items shall correspond to each aspect of the Work, establishing in detail the portion of the Contract Price allocated to each major component of the Work.
   2. Upon request of ENGINEER, support values with data that substantiate their correctness.
   3. Submit preliminary Schedule of Values to ENGINEER for initial review. CONTRACTOR shall incorporate ENGINEER's comments into the Schedule of Values and resubmit to ENGINEER. ENGINEER may require corrections and re-submittals until Schedule of Values is acceptable.
   4. Schedule of Values may be used as a basis for negotiating price of changes, if any, in the Work.
   5. Schedule of Values and the Progress Schedule updates specified in Section 01 32 16, Progress Schedule, will be basis for preparing each Application for Payment.

1.2 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Submit to ENGINEER Schedule of Values in the form and quantity required in Section 01 33 00, Submittal Procedures.
   2. Content of Schedule of Values submittals shall be in accordance with Article 1.3 of this Section.
   3. Timing of Submittals:
      a. Submit preliminary Schedule of Values within ten days following the date that the Contract Times commence running in accordance with the Notice to Proceed.
      b. Submittal of the Schedule of Values for acceptance by ENGINEER shall be in accordance with the General Clauses. ENGINEER will not accept Applications for Payment without an acceptable Schedule of Values.
      c. When required by ENGINEER, promptly submit updated Schedule of Values to include cost breakdowns for changes in the Contract Price.

1.3 SCHEDULE OF VALUES FORMAT AND CONTENT

A. Organization and Major Elements of Schedule of Values
   1. Include in Schedule of Values itemized list of Work for each major work area included in the Work, for each payment item specified in Section 01 22 13, Measurement and Payment. Group the Work in the Schedule of Values into the following areas:
      a. Site Work.
      b. Structural Modifications.
         1) This shall include the demolition and reconstruction of the existing pumping station walls and top slab as well as the new platform for the generator and Electrical Building.
      c. Electrical Building Systems.
      d. Dry Well Systems.
      e. Wet Well Systems.
   3. Organization in Accordance with Specification Sections:
      a. Within each work area, organize the Schedule of Values by the various Specifications Section numbers and titles included in the Contract Documents.
      b. Label each row in the Schedule of Values with the appropriate Specifications Section number. Include an amount for each row in the Schedule of Values.
      c. List sub-items of major products or systems, as appropriate or when requested by ENGINEER.
   4. Include in Schedule of Values unit price payment items with their associated quantity. Provide in the Schedule of Values detailed breakdown of unit prices when required by ENGINEER.

B. Requirements for preliminary Schedule of Values and Schedule of Values are:
   1. Subcontracted Work:
      a. Schedule of Values shall show division of Work between CONTRACTOR and Subcontractors.
      b. Line items for Work to be done by Subcontractor shall include the word, "(SUBCONTRACTED)".
   2. Apportionment between Materials and Equipment, Installation, and Testing:
      a. Schedule of Values shall include breakdown of costs for materials and equipment, installation, testing, and other costs used in preparing the Bid by CONTRACTOR and each Subcontractor.
      b. List purchase and delivery costs for materials and equipment for which CONTRACTOR may apply for payment as stored materials.
   3. Sum of individual values shown on the Schedule of Values shall equal the total of associated payment item. Sum of payment item totals in the Schedule of Values shall equal the Contract Price.
   4. Overhead and Profit: Include in each line item a directly proportional amount of CONTRACTOR's overhead and profit. Do not include overhead and profit as separate item(s).
   5. Include separate line item for each allowance, and for each unit price item.

6. Bonds and Insurance Costs: Include line item for bonds and insurance, in amount not exceeding 3.0 percent of the Contract Price, excluding the bid price for the Miscellaneous Additional Work (Item W800). This amount may be applied for in the first Application for Payment.
7. Include relevant items for the General Clauses, permits (when applicable), construction Progress Schedule, and other items required by ENGINEER. Include such items in Applications for Payment on payment schedule acceptable to ENGINEER
8. Line items for Site maintenance such as dust control, snow removal, compliance with storm water pollution prevention plans and permits, spill prevention control and countermeasures plans, and for construction photographic documentation; temporary utilities and temporary facilities, field offices, temporary controls, field engineering, and similar Work shall be included in the Schedule of Values and proportioned in Applications for Payment throughout duration of the Work.
9. Mobilization:
    a. Include separate line items under each appropriate payment item for mobilization and demobilization. Document for ENGINEER the activities included in mobilization and demobilization line items.
    b. Mobilization will be limited to two-percent of the Contract Price, and will be paid in one payment.
10. Costs for Shop Drawings, Samples, and other submittals; operations and maintenance manuals; field testing; and training of operations and maintenance personnel shall be as follows, unless otherwise accepted by ENGINEER:
    a. Up to eight percent of cost (including all associated overhead and profit) of each equipment item, exclusive of transportation and installation costs associated with that item, may be allocated to preparation of Shop Drawings, Samples ,and other submittals and may be included in the Application for Payment following ENGINEER's approval of Shop Drawings (and acceptance of other submittals, as applicable) required for fabricating or purchasing for that item for the Work.
    b. Up to three percent of total cost of each item (including all associated overhead and profit), including materials and equipment, and installation, may be apportioned to testing and included in the Application for Payment following ENGINEER's acceptance of the associated written field testing report(s).
    c. Up to a total of four percent of equipment cost (including all associated overhead and profit), exclusive of transportation and installation costs, may be apportioned to operations and maintenance manuals and training of operations and maintenance personnel, which may be included in the Application for Payment following completion of training for that item.
11. Project Record Documents:
    a. Include in the Schedule of Values a line item with appropriate value for Project record documents.
    b. If adequate record documents are maintained, up to 50 percent of the value of the record documents line item will be eligible for payment,

spread evenly over those progress payments in which construction at the Site is performed.

c. Remainder of Project record documents line item will be eligible for payment when complete record documents are submitted in accordance with the Contract Documents. If record documents submitted are unsatisfactory to ENGINEER, amount may be reduced via set-offs in accordance with the Contract Documents.

12. Schedule of Values shall include an itemized list of Work by work area, as applicable, for Work included in Section 01 14 16, Coordination with Owner's Operations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 31 13

PROJECT COORDINATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall coordinate the Work, including testing agencies whether hired by CONTRACTOR, OWNER, or others; Subcontractors, Suppliers, and others with whom coordination is necessary, in accordance with the General Conditions, Supplementary Conditions, and this Section, to perform the Work within the Contract Times and in accordance with the Contract Documents.

B. Coordination:
   1.. In accordance with the General Clauses, CONTRACTOR shall cooperate with and coordinate the Work with other contractors, utility owners, utility service companies, OWNER's and facility manager's employees working at the Site, and other entities working at the Site, in accordance with Section 01 11 13, Summary of Work.
   2. CONTRACTOR will not be responsible or liable for damage unless damage is through negligence of CONTRACTOR, or Subcontractors, Supplier, or other entity employed by CONTRACTOR.
   3. Attend and participate in all project coordination and progress meetings, and report on the progress of the Work and compliance with the Progress Schedule.

C. Layout and Coordination Drawings:
   1. Maintain sufficient competent personnel, drafting and computer-aided drafting/design (CADD) equipment, software, systems, and supplies at the Site for preparing layout drawings, coordination drawings, and record documents.
   2. With the Contract Documents and Shop Drawings, use such coordination drawings as tools for coordinating the Work of various trades.
   3. Where such coordination drawings are to be prepared by mechanical, electrical, plumbing, or heating-ventilating-air conditioning Subcontractors and other Subcontractors, ensure that each Subcontractor maintains required personnel and facilities at the Site.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 31 19.13

PRE-CONSTRUCTION CONFERENCE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. A pre-construction conference will be held for the Project.
   2. CONTRACTOR shall attend the conference prepared to discuss all items on the pre-construction conference agenda.
   3. ENGINEER will distribute an agenda, preside at conference, and prepare and distribute minutes to all conference participants and others as requested.

B. Purpose of Pre-construction Conference:
   1. Purpose of conference is to designate responsible personnel, establish working relationships, discuss preliminary schedules submitted by CONTRACTOR, and review administrative and procedural requirements for the Project.
   2. Matters requiring coordination will be discussed and procedures for handling such matters will be established.
   3. Unless otherwise indicated in the Contract Documents or otherwise agreed to by the entities involved, Site mobilization meeting will be part of the pre-construction conference.

1.2 PREPARATION FOR PRE-CONSTRUCTION CONFERENCE

A. Date, Time, and Location:
   1. Conference will be held after execution of the Contract and before Work starts at the Site.
   2. ENGINEER will establish the date, time, and location of conference and notify the interested and involved entities.

B. Submittals Required Prior to Pre-construction Conference:
   1. Submit the following in accordance with the General Clauses and other requirements of the Contract Documents:
      a. Preliminary Progress Schedule.
      b. Preliminary Schedule of Submittals.
      c. Preliminary Schedule of Values.
      d. Listing of identity and general scope of Work or supply (as applicable) of planned Subcontractors and Suppliers. Indicate extent of each Subcontract proposed and overall percentage of Contract Price to be subcontracted.
      e. List of emergency contact information.
      f. Materials lists.

C. CONTRACTOR shall furnish information required and contribute appropriate items for discussion at the pre-construction conference.

D. Handouts for Pre-Construction Conference:
   1. CONTRACTOR shall bring to the conference the following, with sufficient number of copies for each attendee:
      a. Preliminary Progress Schedule, as submitted to ENGINEER.
      b. Preliminary Schedule of Submittals, as submitted to ENGINEER.
      c. Preliminary Schedule of Values, as submitted to ENGINEER.
      d. Listing of identity and general scope of Work or supply of planned Subcontractors and Suppliers.
      e. Materials lists.
      e. List of emergency contact information, in accordance with Article 1.5 of Section 01 35 23, Safety Requirements.

1.3 REQUIRED ATTENDEES

A. Representative of each entity attending the conference shall be authorized to act on that entity's behalf.

B. Contractor Attendance: Conference shall be attended by CONTRACTOR's:
   1. Project manager.
   2. Site superintendent
   3. Project managers for major Subcontractors, and major equipment Suppliers as CONTRACTOR deems appropriate.

C. Other attendees will be representatives of:
   1. OWNER.
   2. ENGINEER.
   3. SITE INSPECTOR.
   4. Others as requested by OWNER, CONTRACTOR, or ENGINEER.

1.4 AGENDA

A. Preliminary Agenda: Be prepared to discuss in detail the topics indicated below. Revisions, if any, to the agenda below will be furnished to required attendees prior to the pre-construction conference.
   1. Procedural and Administrative:
      a. Personnel and Teams:
         1) Designation of roles and personnel.
         2) Limitations of authority of personnel, including personnel who will sign Contract modifications and make binding decisions.
         3) Subcontractors and Suppliers in attendance.
         4) Authorities having jurisdiction.
      b. Procedures for communications and correspondence, including electronic communication protocols.
      c. Copies of the Contract Documents and availability.

d. Subcontractors and Suppliers.
   1) Lists of proposed Subcontractors and Suppliers.
e. The Work and Scheduling:
   1) General scope of the Work.
   2) Contract Times, including Milestones (if any).
   3) Phasing and sequencing.
   4) Preliminary Progress Schedule.
   5) Critical path activities.
f. Safety:
   1) Responsibility for safety.
   2) Contractor's safety representative.
   3) Emergency procedures and accident reporting.
   4) Emergency contact information.
   5) Confined space entry permits.
   6) Hazardous materials communication program.
   7) Impact of Project on public safety.
g. Permits.
h. Review of insurance requirements and insurance claims.
i. Coordination:
   1) Project coordination, and coordination among contractors.
   2) Construction coordinator.
   3) Coordination with Owner's operations.
   4) Progress meetings.
   1) Preliminary Schedule of Submittals.
   2) Procedures for furnishing and processing submittals.
   3) Work not eligible for payment until submittals are approved or accepted (as required).
   4) Construction photographic documentation.
j. Submittals:
   1) Preliminary Schedule of Submittals.
   2) Submittal procedures.
   3) Contractor coordination and approval stamp.
   4) Meaning of Engineer's actions/submittal disposition.
   5) Preliminary discussion of initial, critical submittals.
   6) Construction photographic documentation.
k. Substitutes and "Or-Equals":
   1) Product options.
   2) Procedures for proposing "or-equals".
   3) Procedures for proposing substitutes.
l. Contract Clarification Procedures
   1) Requests for interpretation.
   2) Clarification notices.
   3) Proposal requests.
   4) Miscellaneous Additional Work proposals.
   5) Miscellaneous Additional Work.
   6) Procedure for filing Claims.
m. Payment:

1) Owner's Project financing and funding, as applicable.
2) Owner's tax-exempt status.
3) Preliminary Schedule of Values
4) Procedures for measuring for payment.
5) Retainage.
6) Progress payment procedures.
7) Prevailing wage rates and payrolls.

n. Testing and inspections, including notification requirements.
o. Disposal of demolition materials.
p. Record documents.
q. Preliminary Discussion of Contract Closeout:
1) Procedures for Substantial Completion.
2) Contract closeout requirements.
3) Correction period.
4) Duration of bonds and insurance.

2. Site Mobilization (if not covered in a separate meeting):
a. Working hours and overtime.
b. Field offices, storage trailers, and staging areas.
c. Temporary facilities.
d. Temporary utilities and limitations on utility consumption (where applicable).
e. Utility company coordination (if not done as a separate meeting).
f. Access to Site, access roads, and parking for construction vehicles.
g. Maintenance and protection of traffic.
h. Use of Site and premises.
i. Protection of property.
j. Security.
k. Temporary controls, such as sediment and erosion controls, noise controls, dust control, storm water controls, and other such measures.
l. Site barriers and temporary fencing.
m. Storage of materials and equipment.
n.. Reference points and benchmarks; surveys and layouts.
o. Site maintenance during the Project.
p. Cleaning and removal of trash and debris.
q. Restoration.

3. General discussion and questions.
4. Next meeting.
5. Site visit, if required.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 31 19.23

PROGRESS MEETINGS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Progress meetings will be held throughout the Project. CONTRACTOR shall attend each progress meeting prepared to discuss in detail all items on the agenda.
   2. ENGINEER will preside at progress meetings and will prepare and distribute minutes of progress meetings to all meeting participants and others as requested.

1.2 PREPARATION FOR PROGRESS MEETINGS

A. Date and Time:
   1. Regular Meetings: Every month on a day and time agreeable to OWNER, ENGINEER, and CONTRACTOR.
   2. Other Meetings: As required.

B. Location:
   1. Location mutually agreed upon by OWNER, CONTRACTOR, and ENGINEER.

D. Handouts:
   1. CONTRACTOR shall bring to each progress meeting not less than ten copies of each of the following:
      a. List of Work accomplished since the previous progress meeting.
      b. Up-to-date Progress Schedule.
      c. Up-to-date Schedule of Submittals.
      d. Detailed “look-ahead” schedule of Work planned through the next progress meeting, with specific starting and ending dates for each activity, including shutdowns, deliveries of important materials and equipment, Milestones (if any), and important activities affecting the OWNER, Project, and Site.
      e. When applicable, list of upcoming, planned time off (with dates) for personnel with significant roles on the Project, and the designated contact person in their absence.

1.3 REQUIRED ATTENDANCE

A. Representatives present for each entity shall be authorized to act on that entity's behalf.

B. Required Attendees:
   1. CONTRACTOR:
      a. Project manager.
      b. Site superintendent.
      c. Safety representative.
      d. When needed for the discussion of a particular agenda item, representatives of Subcontractors and Suppliers shall attend meetings.
   2. ENGINEER:
      a. Project manager or designated representative
      b. Construction Administrator.
      c. Others as required by ENGINEER.
   3. OWNER's representative(s), as required.
   4. Testing and inspection entities, as required.
   5. Others, as appropriate.

1.4 AGENDA

A. Preliminary Agenda: Be prepared to discuss in detail the topics listed below. Revised agenda, if any, will be furnished to CONTRACTOR prior to first progress meeting. Progress meeting agenda may be modified by ENGINEER during the Project as required.
   1. Review, comment, and amendment (if required) of minutes of previous progress meeting.
   2. Review of progress since the previous progress meeting.
   3. Planned progress through next progress meeting.
   4. Review of Progress Schedule
      a. Contract Times, including Milestones (if any)
      b. Critical path.
      c. Schedules for fabrication and delivery of materials and equipment.
      d. Corrective measures, if required.
   5. Submittals:
      a. Review status of critical submittals.
      b. Review revisions to Schedule of Submittals.
   6. Contract Modifications
      a. Requests for interpretation.
      b. Written clarifications.
      c. Proposal Requests.
      d. Miscellaneous Additional Work Proposals
      e. Miscellaneous Additional Work.
      f. Claims.
   7. Applications for progress payments.
   8. Problems, conflicts, and observations.

9. Quality standards, testing, and inspections.
10. Coordination between parties.
11. Site management issues, including access, security, maintenance and protection of traffic, maintenance, cleaning, and other Site issues.
12. Safety.
13. Permits.
14. Construction photographic documentation.
15. Record documents status.
16. Punch list status, as applicable.
17. Other business.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 32 16

PROGRESS SCHEDULE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall prepare and submit Progress Schedules and related documents in accordance with the General Conditions, as may be modified by the Supplementary Conditions, and this Section, unless otherwise accepted by ENGINEER.
   2. Maintain and update Progress Schedules and related documents.
   3. ENGINEER's acceptance of the Progress Schedule or related documents, and comments or opinions concerning activities in the Progress Schedule and related documents shall not control CONTRACTOR's independent judgment concerning means, methods, techniques, sequences and procedures of construction, unless the associated means, method, technique, sequence, or procedure is directed by the Contract Documents. CONTRACTOR is solely responsible for complying with the Contract Times.

B. Factors Affecting the Progress Schedule:
   1. In preparing the Progress Schedule, take into consideration submittal requirements and submittal review times, time for fabricating and delivering materials and equipment, source quality control (including shop testing) and field quality control (including testing at the Site), Subcontractors' work, availability and abilities of workers, availability of construction equipment, weather conditions, restrictions in operations at the Site and coordination with OWNER's operations, and other factors that have the potential to affect completion of the Work within the Contract Times.
   2. Comply with sequencing requirements indicated in the following:
      a. Section 01 11 13, Summary of Work.

1.2 SUBMITTALS

A. Quantity of each submittal required and timing of submittals are in this Section.

B. Informational Submittals: Submit the following:
   1. Progress Schedule:
      a. Prepare and submit the Process Schedule and updates in accordance with the requirements of this Section and with the General Clauses.
      b. Submit updated Progress Schedule prior to each progress meeting. When a Progress Schedule remains unchanged from one progress meeting to the next, submit a written statement to that effect. In addition to monthly Progress Schedule submittals, also bring to progress meeting the number

of printed copies of the updated Progress Schedule indicated in Section 01 31 19.23, Progress Meetings.

d. Submit each Progress Schedule submittal with letter of transmittal complying with requirements of the General Clauses and specifically indicating the following:
   1) Listing of activities and dates that have changed since the previous Progress Schedule submittal.
   2) Discussion of problems causing delays, anticipated duration of delays, and proposed countermeasures.

4. Look-Ahead Schedules
   a. Submit a look-ahead schedule of Work planned through the next progress meeting in accordance with Section 01 31 19.23, Progress Meetings
5. Recovery Schedule: Submit in accordance with this Section.

1.3 PROGRESS SCHEDULES

A. Type and Organization of Progress Schedules:
   1. Prepare Progress Schedule using Microsoft Project 2003 or later edition, Primavera P6, Primavera Project Planner – P3 software, unless other scheduling software is acceptable to ENGINEER.
   2. Sheet Size: 22 inches by 34 inches, unless otherwise accepted by ENGINEER. Also provide electronic copy (.pdf) via email .
   3. Time Scale: Indicate first date of each work week.
   4. Organization:
      a. Indicate on the separate Schedule of Submittals dates for submitting and reviewing Shop Drawings, Samples, and other submittals.
      b. Group deliveries of materials and equipment into a separate sub-schedule that is part of the Progress Schedule.
      c. Group construction into Work Area sub-schedules (that are part of the Progress Schedule) by Activity.
      d. Clearly indicate the Critical Path on the Progress Schedule.
      e. Organize each Work Area sub-schedule by Specifications Section number.

B. Content: Progress Schedules shall indicate the following:
   1. Dates for shop-testing.
   2. Delivery dates for materials and equipment to be incorporated into the Work.
   3. Dates for beginning and completing each phase of the Work by activity and by trade.
   4. Dates for start-up and check-out, field-testing, and instruction of Owner's personnel.
   5. Dates corresponding to the Contract Times, and planned completion date associated with each Milestone (if any), Substantial Completion, and readiness for final payment.

1.4 LOOK-AHEAD SCHEDULES

A. Provide detailed "look-ahead" schedule of Work planned through the next progress meeting with specific starting and ending dates for each activity, including shutdowns, deliveries of important materials and equipment, Milestones (if any), and important activities affecting the Owner, Project, and Site.

1.5 RECOVERY SCHEDULES

A. Recovery Schedules – General:
   1. When updated Progress Schedule indicates that the ability to comply with the Contract Times falls ten or more days behind schedule, and there is no excusable delay, Change Order, or Work Change Directive to support an extension of the Contract Times, CONTRACTOR shall prepare and submit a Progress Schedule demonstrating CONTRACTOR's plan to accelerate the Work to achieve compliance with the Contract Times ("recovery schedule") for ENGINEER's acceptance.
   2. Submit recovery schedule within ten days after submittal of updated Progress Schedule where need for recovery schedule is indicated.

B. Implementation of Recovery Schedule:
   1. At no additional cost to OWNER, do one or more of the following: furnish additional labor, provide additional construction equipment, provide suitable materials, employ additional work shifts, expedite procurement of materials and equipment to be incorporated into the Work, and other measures necessary to complete the Work within the Contract Times.
   2. Upon acceptance of recovery schedule by ENGINEER, incorporate recovery schedule into the next Progress Schedule update.

C. Lack of Action:
   1. CONTRACTOR's refusal, failure, or neglect to take appropriate recovery action, or to submit a recovery schedule, shall constitute reasonable evidence that CONTRACTOR is not prosecuting the Work or separable part thereof with the diligence that will ensure completion within the Contract Times. Such lack of action shall constitute sufficient basis for OWNER to exercise remedies available to OWNER under the Contract Documents.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall retain professional photographer to perform services specified, including:
      a. Digital photography.
   2. Furnish photographic documentation for the following:
      a. Pre-construction.
      b. Construction progress.
      c. Final.

B. Image Quality:
   1. Photographic documentation shall be in color.
   2. Photographic images shall be suitably staged and set up ("framed"), focused, and shall have adequate lighting to illuminate the Work and conditions that are the subject of the photograph.
   3. For still photographs, use camera with minimum 16.0-megapixel resolution.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. Photographer:
      a. Photographer shall be a specialist regularly engaged in professional photography and experienced in photographing construction sites.
      b. Upon request of ENGINEER, submit documentation of photographer having successfully performed photographic documentation for not less than five previous construction projects, each lasting not less than six months.

B. At the Site, ENGINEER or Resident Project Representative will indicate the views to be taken and will select time at which images will be taken. Photographic subjects, views, and angles will vary with progress of the Work.

1.3 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Pre-construction Photographic Documentation: Submit acceptable pre-construction photographic documentation (prints and digital files) prior to mobilizing to and disturbing the Site. Submit pre-construction photographic documentation not later than the first Application for Payment, unless other

schedule for pre-construction photographic documentation is accepted by ENGINEER.

2. Construction Progress Photographic Documentation: Submit acceptable construction progress photographic documentation (prints and digital files) not less-often than monthly. Submit with each Application for Payment, unless otherwise agreed to by ENGINEER.

B. Closeout Submittals: Submit the following:
   1. Final Photographic Documentation: Submit acceptable final photographic documentation (prints and digital files) prior to requesting the final inspection by ENGINEER.

1.4 PHOTOGRAPHIC DOCUMENTATION – GENERAL

A. Photographic Prints:
   1. Quantity: For each photograph taken, submit to ENGINEER one print.
   2. Print Size and Finish:
      a. Photographs: Submit five-inch by seven-inch prints on professional-grade, nine-mil-thick, photographic paper with semi-gloss or satin finish, unless otherwise specified.
   3. Include the following information on back of each print:
      a. Date photograph was taken.
      b. Name of OWNER.
      c. Name of the Site.
      d. Project name and Contract Number.
      e. Description of view shown in photograph.
      f. Photographer name and address.

B. Digital Files of Photographs:
   1. For each photograph taken, furnish high-quality digital image in "JPG" file format compatible with Microsoft Windows 7 and higher operating systems.
   2. Image resolution shall be sufficient for clear, high-resolution prints. Minimum resolution shall be 150 dots per inch (dpi). Minimum size of digital images shall be equal to specified print size.
   3. Do not imprint date and time in the image.
   4. Electronic image filename shall describe the image; do not submit filenames automatically created by digital camera. For example, an acceptable electronic filename would be, "Weaver Street Station – Looking West at Pump No. 1.jpg".
   5. Form of Digital Submittal – Images on Discs:
      a. Submit digital files on compact discs (CD) or universal serial bus (USB).
      b. Submit three copies of each disc or USB with digital files of photographic images.
      c. Include the following information on front of each disc containing photographic documentation:
         1) Date(s) photographs were taken.
         2) Name of OWNER.

3) Name of the Site.
4) Project name and Contract Number.
5) Photographer name and address.

1.5 PRE-CONSTRUCTION PHOTOGRAPHIC DOCUMENTATION

A. Pre-construction Photographic Documentation:
   1. Obtain and submit sufficient pre-construction photographic documentation to record Site conditions prior to construction. Photographs shall document work areas of all prime contracts under the Project.
   2. Pre-construction photographs are not part of required number of construction progress photographs specified in Article 1.6 of this Section.

B. If disagreement arises on the condition of the Site and insufficient pre-construction photographic documentation was submitted prior to the disagreement, restore the grounds or area in question to extent directed by ENGINEER and to satisfaction of ENGINEER.

1.6 CONSTRUCTION PROGRESS PHOTOGRAPHIC DOCUMENTATION

A. Progress Photographs:
   1. Take photographs not less often than once per week.
   2. Take not less than ten photographs each time photographer is at the Site.
   3. Maximum number of progress photographs required will be 680, based on the Contract Times to Substantial Completion of the entire Project and scope of the Project on date the Contract Times commence running. Proportionately modify the extent of photographic documentation if scope of the Project or the Contract Times are modified.
   4. Obtain and submit interior and exterior photographic documentation of each structure in the work area as directed by ENGINEER at the time photographic documentation is taken.

1.7 FINAL PHOTOGRAPHIC DOCUMENTATION

A. Final Photographs:
   1. Take photographs at time and day acceptable to ENGINEER. Do not take final photographs prior to Substantial Completion of the entire Project. Work documented in final photographs shall be generally complete, including painting and finishing, furnishings, landscaping, and other visible Work
   2. Take not less than 30 final photographs, based on scope of the Project at the time that the Contract Times commence running. Proportionately modify the number of final photographs if scope of Project is modified. Final photographs are not part of construction progress photographs required under Paragraph 1.6.A of this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall prepare and furnish submittals in accordance with Article 44 of the General Clauses and this Section.
   2. Provide submittals well in advance of need for the material or equipment, or procedure (as applicable), in the Work and with ample time required for delivery of materials and equipment and to implement procedures following ENGINEER's approval or acceptance of the associated submittal. Work covered by a submittal will not be included in progress payments until approval or acceptance of related submittals has been obtained in accordance with the Contract Documents.
   3. CONTRACTOR is responsible for dimensions to be confirmed and corrected at the Site; quantities; information pertaining solely to fabrication processes; means, methods, sequences, procedures, and techniques of construction; safety precautions and programs incident thereto; and for coordinating the work of all trades.
   4. CONTRACTOR's signature of submittal's stamp and letter of transmittal shall be CONTRACTOR's representation that CONTRACTOR has complied with his obligations under the Contract Documents relative to that submittal. ENGINEER and OWNER shall be entitled to rely on such representations by CONTRACTOR.
   5. Provisions of the General Clauses apply to all CONTRACTOR-furnished submittals required by the Contract Documents, regardless of whether such submittals are other than Shop Drawings or Samples.

B. Samples:
   1. Submittal of Samples shall comply with the General Clauses, this Section, and the Specifications Section in which the Sample is specified.
   2. Furnish at the same time those Samples and submittals that are related to the same element of the Work or Specifications Section. ENGINEER will not review submittals without associated Samples, and will not review Samples without associated submittals.
   3. Samples shall clearly illustrate functional characteristics of materials, all related parts and attachments, and full range of color, texture, pattern, and materials.

1.2 TYPES OF SUBMITTALS

A. Submittal types are classified as follows: 1) Action Submittals, 2) Informational Submittals, 3) Closeout Submittals, and 4) Maintenance Material submittals. Type of each required submittal is designated in the respective Specifications Sections; when type of submittal is not designated in the associated Specification Section, submittal will be classified as follows:

1. Action Submittals include:
    a. Shop Drawings.
    b. Product data.
    c. Delegated design submittals, which include documents prepared, sealed, and signed by a design professional retained by CONTRACTOR, Subcontractor, or Supplier for materials and equipment to be incorporated into the completed Work. Delegated design submittals do not include submittals related to temporary construction unless specified otherwise in the related Specifications Section. Delegated design submittals include: design drawings, design data including calculations, specifications, certifications, and other submittals prepared by such design professional.
    d. Samples.
    e. Testing plans, procedures, and testing limitations.
2. Informational Submittals include:
    a. Certificates.
    b. Design data not sealed and signed by a design professional retained by CONTRACTOR, Subcontractor, or Supplier.
    c. Pre-construction test and evaluation reports, such as reports on pilot testing, subsurface investigations, testing for a potential Hazardous Environmental Condition, and similar reports.
    d. Supplier instructions, including installation data, and instructions for handling, starting-up, and troubleshooting.
    e. Source quality control submittals (other than testing plans, procedures, and testing limitations), including results of shop testing.
    f. Field or Site quality control submittals (other than testing plans, procedures, and testing limitations), including results of operating and acceptability tests at the Site.
    g. Supplier reports.
    h. Sustainable design submittals (other than sustainable design closeout documentation).
    i. Special procedure submittals, including plans for shutdowns and tie-ins and other procedural submittals.
    j. Qualifications statements.
3. Closeout Submittals include:
    a. Final photographic documentation.
    b. Operations and maintenance data.
    c. Bonds, such as special maintenance bonds and bonds for a specific material, equipment item, or system.
    d. Warranty documentation.

e. Record documentation.
f. Sustainable design closeout documentation.
g. Software.

4. Maintenance Material Submittals include:
   a. Spare parts.
   b. Extra stock materials.
   c. Tools.
5. When type of submittal is not specified and is not included in the list above, request an interpretation from ENGINEER and ENGINEER will determine the type of submittal.

B. Not Included in this Section: Administrative and procedural requirements for following are covered elsewhere in the Contract Documents:
   1. Requests for interpretations of the Contract Documents.
   2. Change Orders, Work Change Directives, and Field Orders.
   3. Applications for Payment.
   4. Progress Schedules.
   5. Photographic documentation.
   6. Reports, documentation, and permit applications required to be furnished by CONTRACTOR to authorities having jurisdiction.

1.3 REQUIREMENTS FOR SCHEDULE OF SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Schedule of Submittals:
      a. Timing:
         1) Furnish submittal within time frames indicated in the Contract Documents.
         2) Submit updated Schedule of Submittals with each submittal of the updated Progress Schedule.
      b. Content: In accordance with the General Conditions, as may be modified by the Supplementary Conditions, and this Section. Requirements for content of preliminary Schedule of Submittals and subsequent submittals of the Schedule of Submittals are identical. Identify on Schedule of Submittals all submittals required in the Contract Documents. Updates of Schedule of Submittals shall show scheduled dates and actual dates for completed tasks. Indicate submittals that are on the Project's critical path. Indicate the following for each submittal:
         1) Date by which submittal will be received by ENGINEER.
         2) Whether submittal will be for a substitution or "or-equal". Procedures for requesting approval of substitutes and "or-equals" are specified in the General Clauses and the Division 01 Specifications.
         3) Date by which ENGINEER's response is required. Not less than 14 days shall be allowed for ENGINEER's review, starting upon ENGINEER's actual receipt of each submittal. Allow increased time for large or complex submittals.

4) For submittals for materials or equipment, date by which material or equipment must be at the Site to avoid delaying the Work and to avoid delaying the work of other contractors, if any.

c. Prepare Schedule of Submittals using same software, and in same format, specified for Progress Schedules in Section 01 32 16, Progress Schedule.

d. Coordinate Schedule of Submittals with the Progress Schedule.

e. Schedule of Submittals that is not compatible with the Progress Schedule, or that does not indicate submittals on the Project's critical path, or that that places extraordinary demands on ENGINEER for time and resources, is unacceptable. Do not include submittals not required by the Contract Documents.

f. In preparing Schedule of Submittals:
   1) Considering the nature and complexity of each submittal, allow sufficient time for review and revision.
   2) Reasonable time shall be allowed for: ENGINEER's review and processing of submittals, for submittals to be revised and resubmitted, and for returning submittals to CONTRACTOR.
   3) Identify and accordingly schedule submittals that are expected to have long anticipated review times.

1.4 PROCEDURE FOR SUBMITTALS

A. Submittal Identification System: Use the following submittal identification system, consisting of submittal number and review cycle number.
   1. Submittal Number: Shall be separate and unique number correlating to each individual submittal required. Assign submittal numbers as follows:
      a. First part of submittal number shall be the applicable Specifications Section number, followed by a hyphen.
      b. Second part of submittal number shall be a three-digit number (sequentially numbered from 001 through 999) assigned to each separate and unique submittal furnished under the associated Specifications Section.
      c. Typical submittal number for the third submittal furnished for Section 40 05 19, Ductile Iron Process Pipe, would be "40 05 19-003".
   2. Review Cycle Number: Shall be a letter designation indicating the initial submittal or re-submittal associated with each submittal number:
      a. "A" = Initial (first) submittal.
      b. "B" = Second submittal (e.g., first re-submittal).
      c. "C" = Third submittal (e.g., second re-submittal).
   3. Examples:

Example Description	Submittal Identification	
	Submittal No.	**Review Cycle**
Initial (first) review cycle of the third submittal provided under Section 40 05 19, Ductile Iron Process Pipe	40 05 19-003-	A
Second review cycle (first re-submittal) of third submittal provided under Section 40 05 19, Ductile	40 05 19-003-	B

Iron Process Pipe	

B. Letter of Transmittal for Submittals:
   1. Furnish separate letter of transmittal with each submittal. Each submittal shall be for one Specifications Section.
   2. At beginning of each letter of transmittal, include a reference heading indicating: CONTRACTOR's name, OWNER's name, Project name, Contract designation, transmittal number, and submittal number.
   3. For submittals with proposed deviations from requirements of the Contract Documents, letter of transmittal shall specifically describe each proposed variation.

C. Contractor's Review and Stamp:
   1. Contractor's Review: Before transmitting submittals to ENGINEER, review submittals to:
      a. ensure proper coordination of the Work;
      b. determine that each submittal is in accordance with CONTRACTOR's desires;
      c. verify that submittal contains sufficient information for ENGINEER to determine compliance with the Contract Documents.
   2. Incomplete or inadequate submittals will be returned without review.
   3. Contractor's Stamp and Signature:
      a. Each submittal furnished shall bear CONTRACTOR's stamp of approval and signature, as evidence that submittal has been reviewed by CONTRACTOR and verified as complete and in accordance with the Contract Documents.
      b. Submittals without CONTRACTOR's stamp and signature will be returned without review. Signatures that appear to be computer-generated will be regarded as unsigned and the associated submittal will be returned without review.
      c. CONTRACTOR's stamp shall contain the following:

"Project Name (Including Contract No.): _____

Contractor's Name: _____

Contract Designation: _____

Date: _____

---------- *Reference* ----------

Submittal Title: _____

Specifications:

Section: _____

Page No.: _____

Paragraph No.: _____

Drawing No.: _____ of _____

Location of Work: _____

Submittal No. and Review Cycle: _____

Coordinated by Contractor with Submittal Nos.: _____

_____

I hereby certify that the Contractor has satisfied Contractor's obligations under the Contract Documents relative to Contractor's review and approval of this submittal.

Approved for Contractor by: _____"

D. Submittal Marking and Organization:
   1. Mark on each page of submittal and each individual component submitted with submittal number and applicable Specifications paragraph.
   2. Arrange submittal information in same order as requirements are written in the associated Specifications Section.
   3. Each Shop Drawing sheet shall have title block with complete identifying information satisfactory to ENGINEER.
   4. Package together submittals for the same Specifications Section. Do not furnish required information piecemeal.

E. Format of Submittal and Recipients:
   1. Action Submittals and Informational Submittals: Furnish in accordance with Table 01 33 00-A, except that submittals of Samples shall be as specified elsewhere in this Section:

TABLE 01 33 00-A: SUBMITTAL CONTACTS AND REQUIRED FORMAT

	Address for Deliveries	Contact Person	E-mail Address	Format*	No. of Printed Copies
a.	Engineer: Arcadis of New York, Inc. 44 South Broadway, Suite 1200, White Plains, New York 10601	Chelsea Catchpole	chelsea.catchpole@arcadis.com	E	--
b.	Resident Project Representative: At the Site.	TBD	To be determined	E & P	One
* **Format**: E = Electronic files; P = Printed copies. TBD = To Be Determined					

   2. Samples:
      a. Securely label or tag Samples with submittal identification number. Label or tag shall include clear space at least four inches by four inches in size for affixing ENGINEER's review stamp. Label or tag shall not cover, conceal, or alter appearance or features of Sample. Label or tag shall not be separated from the Sample.

b. Submit quantity of Samples required in Specifications. If quantity of Samples is not indicated in the associated Specifications Section, furnish not less than two identical Samples of each item required for ENGINEER's approval. Samples will not be returned to CONTRACTOR. If CONTRACTOR requires Sample(s) for CONTRACTOR's use, so advise ENGINEER in writing and furnish additional Sample(s). CONTRACTOR is responsible for furnishing, shipping, and transporting additional Samples.

c Deliver one Sample to ENGINEER at address indicated in Table 01 33 00-A, unless otherwise directed by ENGINEER.

3. Closeout Submittals:
   a. Furnish the following Closeout Submittals in accordance with Table 01 33 00-A: maintenance contracts; bonds for specific materials, equipment, or systems; warranty documentation; and sustainable design closeout documentation. On documents such as maintenance contracts and bonds, include on each document furnished original ("wet") signature of entity issuing said document.
   b. Two printed copies of each final "Approved" or "Approved as Corrected" shop drawing to be submitted to the OWNER.
   c. Operations and Maintenance Data: Submit in accordance with Section 01 78 23, Operation and Maintenance Data.
   d. Record Documentation: Submit in accordance with Section 01 78 39, Project Record Documentation.
   e. Software: Submit number of copies required in Specifications Section where the software is specified. If number of copies is not specified, provide two copies on compact disc in addition to software loaded on OWNER's computer(s) or microprocessor(s).
4. Maintenance Material Submittals: For spare parts, extra stock materials, and tools, furnish quantity of items specified in associated Specifications Section. Furnish in accordance with Section 01 78 43, Spare Parts and Extra Materials.

F. Electronic Submittals:
   1. Format: Electronic files shall be in "portable document format" (.PDF). Files shall be electronically searchable.
   2. Organization and Content:
      a. Each electronic submittal shall be one file; do not divide individual submittals into multiple files each.
      b. When submittal is large or contains multiple parts, furnish PDF file with bookmark for each section of submittal.
      c. Content shall be identical to printed submittal. First page of electronic submittal shall be CONTRACTOR's letter of transmittal.
   3. Quality and Legibility: Electronic submittal files shall be made from the original and shall be clear and legible. Do not submit scans of faxed copies. Electronic file shall be full size of original, printed documents. Properly orient all pages for reading on a computer screen.
   4. Provide sufficient Internet service and e-mail capability for CONTRACTOR's use in transferring electronic submittals, receiving responses to electronic

submittals, and associated electronic correspondence. Check not less than once per day for distribution of electronic submittals, electronic responses ot submittal, and electronic correspondence related to submittals.

5. Submitting Electronic Files:
    a. Transmit printed copies of submittals in accordance with Table 01 33 00-A for delivery on same day that electronic files are delivered.
    b. Transmit electronic submittals files via e-mail in accordance with Table 01 33 00-A.

G. Distribution:
1. Distribution of ENGINEER's Response via Electronic Files: Upon completion of ENGINEER's review, electronic submittal response will be distributed by ENGINEER to
    a. CONTRACTOR.
    b. OWNER.
    c. Resident Project Representative (RPR).
    d. ENGINEER's file.
2. Distribution of ENGINEER's Response via Printed Copies: ENGINEER will distribute each reviewed submittal requiring ENGINEER's written response as follows:
    a. OWNER: One copy for final approved submittals (except for Samples).
    b. Resident Project Representative (RPR): One copy for final approved submittals (except closeout submittals and maintenance material submittals).

H. Resubmittals: Refer to the General Clauses for requirements regarding resubmitting required submittals.

1.5 ENGINEER'S REVIEW

A. Timing: ENGINEER's review will conform with timing indicated in the Schedule of Submittals accepted by ENGINEER.

B. Submittals not required by the Contract Documents will not be reviewed by ENGINEER and will not be recorded in ENGINEER's submittal log. All printed copies of such submittals will be returned to CONTRACTOR. Electronic copies of such submittals, if any, will not be retained by ENGINEER.

C. Action Submittals, Results of ENGINEER's Review: Each submittal will be given one of the following dispositions by ENGINEER:
1. Approved: Upon return of submittal marked "Approved", order, ship, or fabricate materials and equipment included in the submittal (pending ENGINEER's approval or acceptance, as applicable, of source quality control submittals) or otherwise proceed with the Work in accordance with the submittal and the Contract Documents.
2. Approved as Corrected: Upon return of submittal marked "Approved as Corrected", order, ship, or fabricate materials and equipment included in the

submittal (pending ENGINEER's approval or acceptance, as applicable, of source quality control submittals) or otherwise proceed with the Work in accordance with the submittal and the Contract Documents, and in accordance with the corrections indicated in the ENGINEER's submittal response.

3. Approved as Corrected – Resubmit: Upon return of submittal marked "Approved as Corrected – Resubmit", order, ship, or fabricate materials and equipment included in the submittal (pending ENGINEER's approval or acceptance, as applicable, of source quality control submittals) or otherwise proceed with the Work in accordance with the submittal and the Contract Documents, and in accordance with corrections indicated in ENGINEER's submittal response. Furnish to ENGINEER record re-submittal with all corrections made. Receipt of corrected re-submittal is required before materials or equipment covered in the submittal will be eligible for payment.
4. Revise and Resubmit: Upon return of submittal marked "Revise and Resubmit", make the corrections indicated and re-submit to ENGINEER for approval.
5. Not Approved: This disposition indicates material or equipment that cannot be approved. "Not Approved" disposition may also be applied to submittals that are incomplete. Upon return of submittal marked "Not Approved", repeat initial submittal procedure utilizing approvable material or equipment, with a complete submittal clearly indicating all information required.

D. Informational Submittals, Results of ENGINEER's Review:
   1. Each submittal will be given one of the following dispositions:
      a. Accepted: Information included in submittal complies with the applicable requirements of the Contract Documents, and is acceptable. No further action by CONTRACTOR is required relative to this submittal, and the Work covered by the submittal may proceed, and materials and equipment with submittals with this disposition may be shipped or operated, as applicable.
      b. Not Accepted: Submittal does not indicate compliance with applicable requirements of the Contract Documents and is not acceptable. Revise submittal and re-submit to indicate acceptability and compliance with the Contract Documents.

E. Closeout Submittals, Results of ENGINEER's Review: Dispositions and meanings are the same as specified for Informational Submittals. When acceptable, Closeout Submittals will not receive a written response from ENGINEER. Disposition as "accepted" will be recorded in ENGINEER's submittal log. When Closeout Submittal is not acceptable, ENGINEER will provide written response to CONTRACTOR.

F. Maintenance Material Submittals, Results of ENGINEER's Review: Dispositions and meanings are the same as specified for Informational Submittals. When acceptable, Maintenance Material Submittals will not receive a written response from ENGINEER. Disposition as "accepted" will be recorded in ENGINEER's submittal log. When Maintenance Material Submittal is not acceptable, ENGINEER will

provide written response to CONTRACTOR, and CONTRACTOR is responsible for costs associated with transporting and handling of maintenance materials until compliance with the Contract Documents is achieved.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 35 23

SAFETY REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section augments the requirements elsewhere in the Contract Documents regarding CONTRACTOR's responsibilities for safety and protection and includes requirements for CONTRACTOR's safety representative and other safety requirements applicable to the Project.
   2. CONTRACTOR shall provide labor, materials, tools, equipment, training, certifications, protective measures, and incidentals shown, specified, and required to comply with CONTRACTOR's obligations under the Contract for safety and protection of personnel and property.
   3 The following OWNER safety programs are applicable to the Work:
      a. Department of Environmental Facilities (DEF) Environmental Management System (EnvMS) Requirements.

B. Related Sections: Provisions of this Section are coordinated with, but are not limited to, the following:
   1. Section 01 35 43.13, Environmental Procedures for Hazardous Materials.
   2. Section 01 41 28, Confined Space Entry Permit.
   3. Section 01 51 05, Temporary Facilities .
   4. Section 01 71 33, Protection of the Work and Property.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. CONTRACTOR's Safety Representative:
      a. ENGINEER's acceptance of CONTRACTOR's safety representative's qualifications does not in any way mitigate or relieve CONTRACTOR of CONTRACTOR's safety obligations under the Contract Documents.
      b. CONTRACTOR's safety representative shall possess not less than five years of experience serving as the safety representative on projects similar to or larger in size than this Contract, and for type(s) of construction similar in nature to the Work.
      c. CONTRACTOR's safety representative shall be experienced in the types of Work to be performed under the Contract and shall be experienced with safety precautions, procedures, and equipment appropriate for the safe performance of the Work.
      d. Prior to the Effective Date of the Contract, shall have successfully completed a 30-hour OSHA Construction Safety and Health training course, and a 40-hour OSHA Hazardous Materials training course, and training for confined space entry.

e. CONTRACTOR's safety representative shall be completely experienced with and knowledgeable of all applicable health and safety Laws and Regulations and with good safety practices, and shall ensure compliance with such Laws and Regulations and practices at the Site.
f. Minimum responsibilities of CONTRACTOR's safety representative are indicated in this Section.

B. Regulatory Requirements:
1. Occupational Health and Safety (OSHA).

1.3 SUBMITTALS

A. Informational Submittals: Submit the following:
1. Emergency contact information, in accordance with Article 1.5 of this Section.
2. Citations:
a. Copies of safety citations from authorities having jurisdiction and insurance companies, submitted within 24 hours of CONTRACTOR's receipt of such citations.
3. Qualifications Statements:
a. CONTRACTOR's Safety Representative: Submit name and qualifications of CONTRACTOR's safety representative, including summary of experience, and training received and valid certifications and accreditations applicable to the Project.

1.4 SAFETY REPRESENTATIVE RESPONSIBILITIES

A. General:
1. CONTRACTOR's safety representative shall have appropriate space at the Site to maintain and keep available safety records, up-to-date copies of pertinent safety Laws and Regulations, Material Data Sheets, CONTRACTOR's site-specific health and safety plan, copies of OWNER's health and safety requirements with which CONTRACTOR shall comply, and the Site safety plan including information concerning foreseeable emergency conditions, and emergency contact information as required in Article 1.5 of this Section.

B. CONTRACTOR's safety representative's responsibilities include:
1. Duties and responsibilities in accordance with the General Clauses.
2. CONTRACTOR's safety representative shall coordinate with CONTRACTOR's "competent person" required under Laws and Regulations.
3. CONTRACTOR's safety representative shall attend progress meetings in accordance with Section 01 31 19.23, Progress Meetings.
4. Schedule and conduct safety meetings and safety training programs as required by Laws and Regulations, CONTRACTOR's Site-specific health and safety plan (SSHASP), and good safety practices. Include in the SSHASP a specific schedule (dates) of such meetings and an outline of materials to be covered. Advise ENGINEER prior to the time and place of such meetings. Invite OWNER's personnel to meetings. Instruct CONTRACTOR's employees (and

Subcontractors, Suppliers with personnel at the Site, and others for whom CONTRACTOR is responsible) on recognition of hazards, observance of precautions, of the contents of the SSHASP and other safety programs with which CONTRACTOR shall comply, and use of personal protective equipment (PPE) and safety equipment.

5. Determine that operators of specific construction equipment (and permanent equipment used for construction operations) are qualified by training and experience before such personnel are allowed to operate such equipment.
6. Develop and implement emergency response procedures, including names, locations, and contact telephone numbers for emergency services and medical assistance as indicated in requirements for the emergency contact list in Article 1.5 of this Section.
7. Post appropriate notices regarding health and safety Laws and Regulations at locations at the Site and CONTRACTOR's office that afford maximum exposure to personnel.
8. Post appropriate instructions and warning signs in regard to all hazardous areas and hazardous conditions that cannot be eliminated. Identification of such areas shall be based on experience, site surveillance, and severity of the associated hazard. Signage shall not be used in place of appropriate workplace controls.
9. Ascertain via personal inspection that safety Laws and Regulations and safety program requirements are enforced. Make inspections at appropriate frequencies to ensure that machines, tools, and equipment are in a safe operating condition; and that all work areas are free of hazards to the extent practicable. Implement necessary and timely corrective actions to eliminate unsafe acts and unsafe conditions, and submit to ARCADIS daily copy of findings resulting from inspection, using inspection checklist forms established in CONTRACTROR's SSHASP.
10. Submit to ENGINEER copies of safety citations from authorities having jurisdiction and insurance companies within 24 hours of CONTRACTOR's receipt of such citations.
11. Provide appropriate orientation to employees, visitors, Subcontractors, and Supplier personnel at the Site.
12. Perform all related tasks necessary to achieve the highest degree of safety that the nature of the Work allows.

1.5 EMERGENCY CONTACT INFORMATION

A. CONTRACTOR shall submit list of emergency contact information for 24-hour use throughout the Project. Emergency contact information shall be updated and kept current throughout the Project. If personnel or contact information change, furnish updated emergency contact information list at the next progress meeting.

B. CONTRACTOR's list of emergency contact information shall include:
   1. CONTRACTOR's project manager's office, field office, cellular, and home telephone numbers.
   2. CONTRACTOR's Site superintendent's office, field office, cellular, and home

telephone numbers.

3. CONTRACTOR's foreman's field office, cellular (if available), and home telephone numbers.
4. CONTRACTOR's safety represetnative's office, cellular, and home telephone numbers.
5. Major Subcontractors' and Suppliers' office, cellular, and home telephone numbers of project manager and foreman (when applicable).

C. Additional Emergency Contact Information:
   1. OWNER's WCDEF Office Representative: office, cellular, and home telephone numbers.
   2. OWNER's WCDEF Operations Representative: office, cellular, and home telephone numbers.
   3. OWNER's WCDPW&T Representative: office, cellular, and home telephone numbers.
   4. OWNER's central 24-hour emergency telephone number.
   5. ENGINEER's project manager's office, cellular, and home telephone numbers.
   6. Construction Administrator's office, field office, cellular, and home telephone numbers.
   7. Utility companies' 24-hour contact telephone number(s), including gas, water, sewer, oil, telephone, cable television/telecommunications, and other companies or concerns having utilities in the vicinity of the Work.
   8. Highway and street owners' 24-hour telephone number(s).
   9. Emergency telephone numbers, including: "Emergency: Dial 911", and seven-digit telephone numbers for the hospital, ambulance, police, and fire department nearest to the Site. Furnish names of each of these institutions.
   10. Other involved entities as applicable, including the Central School.
   11. Include with list of emergency contact information an 8.5-inch by 11-inch map showing route from the Site to the nearest hospital.

1.6 SAFETY EQUIPMENT

A. General:
   1. CONTRACTOR shall provide proper safety and rescue equipment, adequately maintained and readily available, for any foreseeable contingency.
   2. Such equipment shall include items such as safety ropes and harnesses, fall-prevention devices, stretchers, water safety devices, oxygen breathing apparatus, resuscitators, gas detectors, oxygen deficiency indicators, combustible gas detectors, fire extinguishers and first-aid equipment in accordance with the Division 01 Specifications, and similar equipment.
   3. Keep safety equipment in protected areas. Check safety equipment at scheduled intervals.
   4. Temporary First-Aid Facilities: Provide and maintain in accordance with Section 01 51 05, Temporary Facilities.

B. Safety Equipment Log:
   1. Maintain a log indicating the person who checked the equipment, when

equipment was checked, and that equipment was acceptable.
2. Update equipment log not less-often than monthly.
3. Include in safety representative's onsite records copies of equipment calibration records.

C. Provide replacement safety equipment when primary safety equipment is unavailable due to use or when undergoing maintenance.

D. Personal Protective Equipment (PPE):
1. All persons entering the work areas shall wear appropriate PPE required for the particular area.
2. Remove from the Site any person failing to comply with this or any other safety requirement.
3. Continuously provide all necessary PPE for ENGINEER's employees, Resident Project Representative, and consultants. ENGINEER will furnish for ENGINEER's employees and consultants protective helmets (hard hats), safety eyewear, reflective vests, and hearing protection. CONTRACTOR shall furnish other equipment required.

1.7 EVACUATION DRILL

A. Included in CONTRACTOR's SSHASP shall be evacuation drills, conducted not less-often than once every six months, scheduled and conducted by CONTRACTOR under supervision of CONTRACTOR's safety representative.

B. Perform evacuation drill during regular working hours, scheduled to minimize disruption of the Work.

C. Upon evacuation, CONTRACTOR and all personnel for whom CONTRACTOR is responsible, immediately advise ENGINEER's onsite personnel and OWNER's facility manager that all personnel have been evacuated.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 35 43.13

ENVIRONMENTAL PROCEDURES FOR HAZARDOUS MATERIALS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, tools, and incidentals necessary to comply with environmental procedures for Constituents of Concern.
   2. CONTRACTOR shall develop, implement, and maintain throughout the Project a hazardous materials management program (HMMP) in accordance with Laws and Regulations.
   3. Constituents of Concern Brought to Site by CONTRACTOR: Transport, handle, store, label, use, and dispose of in accordance with this Section, other applicable provisions of the Contract Documents, and Laws and Regulations.
   4. Constituents of Concern Generated by CONTRACTOR:
      a. Materials containing Constituents of Concern shall be properly handled, stored, labeled, transported and disposed of by CONTRACTOR in accordance with Laws and Regulations, and this Section.
      b. If CONTRACTOR will generate or has generated materials containing Constituents of Concern at the Site, obtain a USEPA identification number listing CONTRACTOR's name and address of the Site as generator of the Constituents of Concern. Obtain identification number from state environmental agency or similar authority having jurisdiction at the Site. Submit identification number within time frame specified in Article 1.3 of this Section.
      c. CONTRACTOR shall be responsible for identifying, analyzing, profiling, transporting, and disposing of Constituents of Concern generated by CONTRACTOR.
   5. Fines or civil penalties levied against OWNER for violations committed at the Site by CONTRACTOR, and costs to OWNER (if any) associated with cleanup of a Hazardous Environmental Condition created by CONTRACTOR shall be paid by CONTRACTOR. If CONTRACTOR has exacerbated a Hazardous Environmental Condition existing at the Site prior to the start of the Work, CONTRACTOR shall pay a share of costs associated with fines, civil penalties, and cleanup costs to in proportion equal to the extent of CONTRACTOR's responsibility for creating the Hazardous Environmental Condition and fines and civil penalties associated therewith.

B. Enforcement of Laws and Regulations:
   1. Interests of OWNER are that accidental spills and emissions, Site contamination, and injury of personnel at and near the Site are to be avoided.

2. When OWNER is aware of suspected violations, OWNER will notify CONTRACTOR, and authorities having jurisdiction if OWNER reasonably concludes that doing so is required by Laws or Regulations.
3. Responsibilities regarding Laws and Regulations shall be in accordance with the General Conditions, as may be modified by the Supplementary Conditions.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with Laws and Regulations, including but not limited to the following:
   1. Code of Federal Regulations (CFR), Title 29, Part 1910, Occupational Safety and Health Standards.
   2. CFR, Title 29, Part 1926, Safety and Health Regulations for Construction.
   3. CFR Title 40, Protection of Environment.
   4. CFR, Title 49, Transportation.
   5. Occupational health and safety requirements of state labor department or similar entity; environmental Laws and Regulations of state environmental agency, Laws and Regulations of state department of transportation.

1.3 SUBMITTALS

A. Informational Submittals: Submit the following to the entity(ies) specified for each:
   1. Constituents of Concern (including Chemicals) Proposed for Use at the Site:
      a. Content:
         1) Current (dated within the past two years) material safety data sheets (MSDS) in accordance with 29 CFR 1910.1200 (OSHA Hazard Communication Standard).
         2) Manufacturer of material or equipment containing such substance.
         3) Supplier (if different than manufacturer).
         4) Container size(s) and number of containers proposed to be at the Site.
         5) Minimum and maximum volume of material intended to be stored at the Site.
         6) Description of process or procedures in which Constituent of Concern will be used at the Site.
      b. Furnish the information required above in sufficient time to obtain OWNER's acceptance not later least three days before bringing Constituent of Concern to the Site.
      c. Submit to OWNER's environmental representative with copy to ENGINEER.
   2. Material Containing Constituents of Concern Generated at the Site:
      a. Submit for each Constituent of Concern generated at the Site identification number, analysis results, and number and size of storage containers at the Site.
      b. Furnish such information within not less than 48 hours after CONTRACTOR's receipt of analytical results.
      c. Submit to OWNER's environmental representative with copy to ENGINEER.

3. Permits:
    a. Submit copies of permits for storing, handling, using, transporting, and disposing of materials containing Constituents of Concern, obtained from authorities having jurisdiction.
    b. Submit to OWNER's environmental representative with copy to ENGINEER.
4. Other Documents required for the HMMP: Submit to OWNER's environmental representative the requested documents within 72 hours of CONTRACTOR's receipt of such request. HMMP documents may include emergency/spill response plan, communication plan, and other documents.

1.4 HAZARDOUS MATERIALS MANAGEMENT

A. Obtain OWNER's environmental representative's acceptance before bringing to the Site each material containing a Constituent of Concern.

B. Communication Plan:
1. CONTRACTOR shall develop a communication plan relative to materials containing one or more Constituents of Concern.
2. MSDS Notebooks:
    a. At minimum, maintain at the Site two notebooks containing: 1) Inventory of materials containing a Constituent of Concern (including all chemicals); and, 2) Current (dated within the past two years) material safety data sheets (MSDS) for all materials being used to accomplish the Work, whether or not defined as a Constituent of Concern.
    b. Keep one notebook in CONTRACTOR's field office at the Site; keep second notebook at location acceptable by OWNER's environmental representative.
    c. Keep notebooks up-to-date as materials are brought to and removed from the Site.

C. Emergency/Spill Response Plan: Develop, implement, and maintain an emergency/spill response plan, for each Constituent of Concern or each class/group of material containing a Constituent of Concern, as applicable. At minimum, response plan shall include the following:
1. Description of equipment available at the Site to contain or respond to emergency related to or spill of the material.
2. Procedures for notifying, and contact information for: authorities having jurisdiction, emergency responders, OWNER, ENGINEER, the public as applicable, and other entities as required.
3. Response coordination procedures between CONTRACTOR, OWNER, and others as appropriate.
4. Site plan showing proposed location of Constituents of Concern storage area and location of spill containment/response equipment, and location of storm water drainage inlets and drainage routes, including storm sewers, ditches and swales, and surface waters.

5. Description of Constituent of Concern handling and spill response training provided to CONTRACTOR's and Subcontractors' employees, in accordance with 29 CFR 1926.21(b) and other Laws and Regulations.

D. Storage of Materials Containing Constituents of Concern and Storage of Non-Hazardous Materials:
   1. Vessels containing materials with a Constituent of Concern shall bear applicable hazard diamond(s).
   2. Container Labeling:
      a. Properly label each container of consumable materials, whether or not classified as containing a Constituent of Concern.
      b. Stencil CONTRACTOR's name and, as applicable, Subcontractor's name, on each vessel containing a Constituent of Concern and, for non-hazardous materials, on each container over five-gallon capacity. Containers shall bear securely-attached label clearly identifying contents. Label containers that are filled from larger containers.
      c. If OWNER becomes aware of unlabeled containers at the Site, OWNER's environmental representative will so advise CONTRACTOR. Properly label container(s) within one hour of receipt of such notice from OWNER or remove container from the Site.
   3. To greatest extent possible, store off-Site materials containing a Constituent of Concern until required for use in the Work.

E. Area for Storing Materials Containing a Constituent of Concern:
   1. Maintain designated storage area for materials containing a Constituent of Concern. Storage area shall include secondary containment to prevent release of spilled or leaking substances. Storage area shall include barriers to prevent vehicles from colliding with storage containers, and shall include protection from environmental factors such as weather.
   2. Provide signage in accordance with Laws and Regulations, clearly identifying the storage area.

F. Not less than monthly, CONTRACTOR's safety representative shall meet with OWNER's environmental representative to review CONTRACTOR's HMMP documents, procedures, and inspect storage areas and the Site in general, to verify compliance with this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 41 28

CONFINED SPACE ENTRY PERMIT

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. OWNER has determined that portions of the Site may constitute confined spaces or permit-required confined spaces, as defined in this Section.
   2. CONTRACTOR shall provide appropriate measures, including labor, supervision, equipment, protective devices, and incidentals, to protect the health and safety of personnel at the Site relative to confined spaces, and who may be affected by the Work in confined spaces including, without limitation: employees and agents of CONTRACTOR, Subcontractors, Suppliers, OWNER, ENGINEER, and ENGINEER's consultants, while engaged in performance of their respective duties at Site.
   3. Comply with requirements of OWNER's confined space entry permitting program, if any.

1.2 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. "Confined spaces" are areas on or about the Site as defined in 29 CFR 1910.146(b), 29 CFR 1926.21(b)(6), and other Laws and Regulations. Confined spaces include, but are not limited to: storage tanks, process vessels, bins, boilers and similar spaces; ventilation or exhaust ducts and stacks; manholes, underground utility vaults and chambers, sewers, pipelines, tunnels; and open-topped spaces greater than four feet deep, such as pits, tubs, vaults, and vessels.
   2. "Entry permit" means the written or printed document provided by the employer of personnel entering permit-required confined space, to allow and control entry into permit-required confined space and that contains the information specified in 29 CFR 1926.146(f), and other Laws and Regulations.
   3. "Permit-required confined space" means confined space as defined in 29 CFR 1926.146(b) and other Laws and Regulations, and that has one or more of the following characteristics:
      a. Contains or has potential to contain a hazardous atmosphere.
      b. Contains material that has potential for engulfing an entrant.
      c. Has internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or floors, or by floor that slopes downward and tapers to a smaller cross-section.
      d. Contains other recognized serious safety or health hazard.

4. "Hot work permit" means the written authorization of employer of personnel entering a confined space to perform operations, such as riveting, welding, cutting, burning, and heating, capable of providing a source of ignition.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with Laws and Regulations related to protecting personnel working in or entering confined spaces, including:
   1. Code of Federal Regulations (CFR), Title 29, Part 1910, Occupational Safety and Health Standards.
   2. CFR, Title 29, Part 1926, Safety and Health Regulations for Construction.

1.4 SUBMITTALS

A. Informational Submittals: If acceptable, written response for Informational Submittals required in this Section will not be returned to CONTRACTOR. Submit the following to OWNER; if submittals under this Section are furnished to ENGINEER, ENGINEER will forward all submittals under this Section to OWNER without review.
   1. Plan: Site-specific confined space entry plan, submitted upon request of OWNER.
   2. Permits and Reports: For each time personnel enter a confined space, copies of completed permits required for confined space entry, and completed confined space data sheets, submitted upon request of OWNER.

1.5 CONFINED SPACE ENTRY PLAN

A. Prepare, maintain, and implement Site-specific confined space entry plan which shall be incorporated into CONTRACTOR's Site-specific health and safety plan. Maintain copy of the confined space entry plan at the Site for access by employees, OWNER, and authorities having jurisdiction. Confined space entry plan shall include:
   1. Results of CONTRACTOR's Site-specific hazard assessment to identify confined spaces that are permit-required confined spaces, including list of all such spaces that will be accessed for the Work. Update the list as required throughout the Project.
   2. Requirements for safeguarding access to, and restricting non-permitted personnel from accessing, permit-required confined spaces during the Project.
   3. Project-specific procedures to be followed when entering or accessing permit-required confined spaces.
   4. Documentation of training provided to each person that will enter, or work in conjunction with entry to, permit-required confined spaces
   5. Update the plan by adding copies of permits issued and records of entry to permit-required confined spaces, as required in Article 1.6 of this Section.

1.6 CONFINED SPACE SAFETY

A. Personnel entering confined space shall be trained in accordance with 29 CFR 1926.21 (b)(6), 29 CFR 1910.146(g), and other Laws and Regulations.

B. Comply with 29 CFR 1910.146, other Laws and Regulations, and requirements of authorities having jurisdiction.

C. Recordkeeping: Using the example forms attached to this Section, or other forms required by CONTRACTOR, OWNER, or authority having jurisdiction, issue for each instance of access to permit-required confined space, completed permit(s) and complete associated data sheet. File completed permits and data sheets in the Site-specific confined space entry plan, and submit in accordance with Article 1.4 of this Section. Such permits and information shall include:
   1. Permit for entry to permit-required confined space(s).
   2. Permit for hot work in permit-required confined space(s).
   3. Complete confined space data sheet.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SUPPLEMENTS

A. The example forms listed below, following this Section's "End of Section" designation, are part of this Specifications Section:
   1. "Confined Space Data Sheet" (one page).
   2. "Confined Space Entry Permit (two pages).
   3. "Confined Space Hot Work Permit" (one page).

+ + END OF SECTION + +

CONFINED SPACE DATA SHEET

Name of Confined Space Entered: _____

Location of Confined Space Entered: _____

_____

Contractor/Subcontractor Accessing Confined Space: _____

_____

PRE-ENTRY SYSTEM CONTROLS USED

		Check
Mechanical:	Isolate, lockout and de-energize to zero potential energy.	☐
Engulfment:	Blank/block/cap/bleed off lines. Lock out gates, valves, pumps.	☐
Electrical:	Lockout/Tag-out	☐
Inerting:	Flush/Purge/Vent	☐

Special Precautions: _____

_____

ATMOSPHERE RESULTS

Date of Last-measured Values: _____

	Oxygen	Explosive	H_2S/Toxic	CO	Date/Time Completed	Initials
Permissible Range	19.5%-23.5%	< 10% LFL	< 10 ppm H_2S	< 35 ppm	--	--
Last Measured						
Values This Entry						

SITE AND PERSONNEL SAFETY (check if required, list type where applicable)

Personal Protective Equipment (PPE) Used:

Safety Harness ☐. Life Lines ☐. Hard Hats ☐. Fall Protection ☐. Retrieval ☐. Eye ☐. Ear ☐. Face ☐. Hand ☐. Foot ☐. Respiratory ☐ (type) _____. Clothing ☐ (type) _____

Other: ☐ _____

_____

Rescue and Emergency Equipment On-Hand/Used:

Retrieval Equipment ☐. Fire Extinguishers ☐. Radios/Telephone ☐. Ladder ☐. Other ☐ _____

Equipment on Standby for Rescue Personnel ☐ _____

_____

Site Safety Equipment/Items On-Hand/Used:

Explosion-Proof Lighting ☐. Barriers/Shield/Barricades ☐ (type) _____. Postings/Flagging ☐.

Other ☐ _____

List specific equipment that was isolated, de-energized, and locked out.

_____

CONFINED SPACE ENTRY PERMIT

ENTRY TEAM

Contractor/Subcontractor Accessing Confined Space: _____

Site or Facility: _____

Specific Confined Space to be Entered: _____

Purpose of Entry (describe the work to be performed): _____

_____

_____

_____

Date: _____ **Time:** _____ **Expected Job Duration (days/hours):** _____

Entry Supervisor: _____ **Designated Attendant:** _____

Authorized/Qualified Entrants: _____ _____

_____ _____

_____ _____

Entry Team Rotation:

Date: _____ **Time:** _____

Entry Supervisor: _____ **Designated Attendant:** _____

Authorized/Qualified Entrants: _____ _____

_____ _____

_____ _____

Entry Team Rotation:

Date: _____ **Time:** _____

Entry Supervisor: _____ **Designated Attendant:** _____

Authorized/Qualified Entrants: _____ _____

_____ _____

_____ _____

Communication Procedures:

Entry Team: _____

_____

_____

Standby/Rescue Personnel: _____

_____

_____

Sign-Offs:

Person Authorizing this Entry: _____

Entry Supervisor: _____

Person Terminating Permit: _____ **Date:** _____ **Time:** _____

Distribution to: _____ _____ _____

Attach to this permit a list of rescue and emergency services that can be summoned and the means (such as the equipment to use and the telephone numbers to call) for summoning such emergency services.

ARCADIS Design & Consultancy for natural and built assets

Confined Space Entry Permit (PAGE 2 of 2)

PRE-ENTRY SYSTEM CONTROL

		Check	Date/Initials
Mechanical:	Isolate, lockout and de-energize to zero potential energy.	Completed ☐	_____
Engulfment:	Blank/block/cap/bleed off lines. Lock out gates, valves, pumps.	Completed ☐	_____
Electrical:	Lockout/Tag-out	Completed ☐	_____
Inerting:	Flush/Purge/Vent	Completed ☐	_____

Special Precautions: _____

_____

_____

ATMOSPHERE - Tested by portable atmospheric monitor with audible and visual alarms.
No one will enter a space with an unsafe atmosphere without approval from the Contractor Superintendent.

	Oxygen	Explosive	H_2S/Toxic	CO	Date/Time Completed	Initials
Permissible Range	19.5%-23.5%	< 10% LFL	< 10 ppm H_2S	< 35 ppm	--	--
Pre-Entry						
Post Ventilation						
Continuous						
Continuous						
Continuous						

Ventilation Used (circle one): Mechanical Natural
Special Precautions: (See Confined Space Data Sheet) _____

_____

SITE AND PERSONNEL SAFETY (check if required, list type where applicable)

Personal Protective Equipment (PPE) Required:
Safety Harness ☐. Life Lines ☐. Hard Hats ☐. Fall Protection ☐. Retrieval ☐. Eye ☐. Ear ☐. Face ☐. Hand ☐.
Foot ☐. Respiratory ☐ (type)_____. Clothing ☐ (type)_____.
Other: ☐ _____

_____

Rescue and Emergency Equipment Required:
Retrieval Equipment ☐. Fire Extinguishers ☐. Radios/Telephone ☐. Other ☐ _____.
Equipment on Standby for Rescue Personnel ☐ _____

_____

Site Safety Equipment/Items Required:
Explosion-Proof Lighting ☐. Barriers/Shield/Barricades ☐ (type)_____. Postings/Flagging ☐.
Other ☐ _____.

List specific equipment to be isolated, de-energized, and locked out.

_____

CONFINED SPACE HOT WORK PERMIT

Contractor/Subcontractor Accessing Confined Space for Hot Work: _____

_____

Site or Facility: _____

Specific Confined Space to be Entered: _____

_____

Date: _____ **Time:** _____

Expected Job Duration (days/hours): _____

Purpose of Entry (describe the work to be done): _____

_____

_____

_____

Explain Why Work Cannot be Done Outside of the Confined Space: _____

_____

_____

_____

Safety Equipment Required:

Fire Extinguishers: **Yes** _____ **No** _____ **Number** _____

Type _____

Respirators: **Yes** _____ **No** _____ **Number** _____

Type _____

Other Equipment: _____

_____

Authorizing Supervisor:

Print Name _____

Signature _____

Date Signed _____

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SECTION 01 42 00

REFERENCES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Section includes the following:
      a. Definitions and terminology in general use in the Contract Documents.
      b. Applicable codes.
      c. Abbreviations in general use throughout the Contract Documents.
      d. General requirements regarding reference standards, including a listing of standard-issuing organizations (and their acronyms) used in the Contract Documents.

1.2 DEFINITIONS AND TERMINOLOGY

A. Definitions and terminology applicable to all the Contract Documents are included in the Information for Bidders and the General Conditions.

B. Additional terminology used in the Contract Documents includes the following:
   1. "Indicated" refers to graphic representations, notes, or schedules on the Drawings, or to other paragraphs, provisions, tables, or schedules in the Specifications and similar locations in the other Contract Documents. Terminology such as "shown", "noted", "scheduled", and "specified" are used to help the user locate the reference without limitation on the location.
   2. "Installer", "applicator", or "erector" is CONTRACTOR or another person or entity engaged by CONTRACTOR, either as an employee or Subcontractor, to perform a particular construction activity, including installation, erection, application, or similar Work. Installers shall be experienced in the Work that installer is engaged to perform.
      a. The term "experienced", when used in conjunction with the term "installer", means having successfully completed not less than five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated and required; being familiar with Laws and Regulations; and having complied with requirements of authorities having jurisdiction, and complying with requirements of the Supplier of the material or equipment being installed, unless other experience requirements specific to that element of the Work are indicated elsewhere in the Contract Documents.
   3. Trades: Use of terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter", unless otherwise indicated in the Contract Documents or required by Laws or

Regulations. Such terminology also does not imply that specified requirements apply exclusively to trade personnel of the corresponding generic name.

1.3 APPLICABLE CODES

A. References in the Contract Documents to local code(s) shall mean the following:
   1. New York State Building Code.
   2. Fire Code of New York State.
   3. Plumbing Code of New York State.
   4. Mechanical Code of New York State.
   5. National Electric Code in effect at the location of the Project.
   6. Energy Conservation Construction Code of New York State.
   7. Existing Building Code of New York State.
   8. NFPA 101, Life Safety Code.

1.4 ABBREVIATIONS

A. Common abbreviations that may be found in the Contract Documents are indicated below, alphabetically by their written-out meaning:

alternating current	a-c
ampere	A
antemeridian	a.m.
Architectural Barriers Act	ABA
Americans with Disabilities Act	ADA
Americans with Disabilities Act Accessibility Guidelines	ADAAG
ante meridian	a.m.
average	avg
biochemical oxygen demand	BOD
five-day biochemical oxygen demand	BOD_5
brake horsepower	bhp
British thermal unit	Btu
building information model	BIM
carbonaceous biochemical oxygen demand	CBOD
five-day carbonaceous biochemical oxygen demand	$CBOD_5$
chemical oxygen demand	COD
Centigrade (or Celsius)	C
chlorinated polyvinyl chloride	CPVC
chlorofluorocarbons	CFC
Code of Federal Regulations	CFR
computer-aided drafting and design	CADD, or CAD

cubic inch		cu in
cubic foot		cu ft
cubic yard		cu yd, or CY
cubic feet per minute		cfm
cubic feet per second		cfs
decibel		db
degree Centigrade (or Celsius)	(Write)	degrees C, ^{o}C, or deg C
degrees Fahrenheit		degrees F, ^{o}F, or deg F
diameter		dia
direct current		d-c
dollars		$
each		ea
efficiency		eff
Fahrenheit		F
feet		ft
feet per hour		fph, or ft/hr
feet per minute		fpm
feet per second		fps, or ft/min
figure		fig
flange		flg
foot-pound		ft-lb
gallon		gal
gallons per hour		gph, or gal/hr
gallons per minute		gpm
gallons per second		gps
gram		g
grams per liter		g/L
Hertz		Hz
horsepower		hp or HP
hour		hr
human-machine interface		HMI
inch		in.
inches of mercury		in. Hg
inches water gage		in. w.g.
inch-pound		in.-lb
inside diameter		ID

iron pipe size	IPS
thousand pounds	kips
thousand pounds per square inch	ksi
kilovolt-ampere	kva
kilowatt	kw
kilowatt-hour	kwhr or kwh
linear foot	lin ft or LF
liter	L
Leadership in Energy and Environmental Design (USGBC)	LEED
maximum	max
mercury	Hg
milligram	mg
milligrams per liter	mg/l or mg/L
milliliter	ml
millimeter	mm
million gallons per day	mgd or MGD
million gallon	MG
minimum	min
national pipe threads	NPT
net positive suction head	NPSH
net positive suction head available	NPSHA
net positive suction head required	NPSHR
nitrogen oxide (total concentration of mono-nitrogen oxides such as nitric oxide (NO) and nitrogen dioxide (NO_2))	NOx
nominal pipe size	NPS
number	no.
operator interface terminal	OIT
ounce	oz
ounce-force	ozf
outside diameter	OD
parts per hundred	pph
parts per million	ppm
parts per billion	ppb
polyvinyl chloride	PVC
post meridian	p.m.
pound	lb

pounds per square inch	psi
pounds per square inch absolute	psia
pounds per square inch gauge	psig
pounds per square foot	psf
process control system	PCS
programmable logic controller	PLC
revolutions per minute	rpm
second	sec
specific gravity	sp gr, or SG
square	sq
square foot	sq ft, sf, or ft^2
square inch	sq in., or in^2
square yard	sq yd, or SY
standard	std
standard cubic feet per minute	scfm
total dynamic head	TDH
totally-enclosed fan-cooled	TEFC
volt	V
volts alternating current	vac
volts direct current	vdc
volatile organic compounds	VOC

1.6 REFERENCE STANDARDS

A. Refer to the General Clauses relative to reference standards and resolving discrepancies between reference standards and the Contract Documents. Provisions of reference standards are in effect in accordance with the Specifications.

B. Copies of Standards: Each entity engaged in the Work shall be familiar with reference standards applicable to its construction activity. Copies of applicable reference standards are not bound with the Contract Documents. Where reference standards are needed for a construction activity, obtain copies of standards from the publication source.

C. Abbreviations and Names: Where reference standards, specifications, codes, manuals, Laws or Regulations, or other published data of international, national, regional or local organizations are referred to in the Contract Documents, the organization issuing the standard may be referred to by their acronym or abbreviation only. The following acronyms or abbreviations that may appear in the Contract Documents shall have the meanings indicated below. Listing is alphabetical by acronym.

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACS	American Chemical Society
ADSC-IAFD	International Association of Foundation Drilling.
AEIC	Association of Edison Illuminating Companies
AF&PA	American Forest and Paper Association
ABMA	American Bearing Manufacturers Association (formerly Anti-Friction Bearing Manufacturers Association (AFBMA))
AGMA	American Gear Manufacturers Association
AI	Asphalt Institute
AIA	American Institute of Architects
AIChE	American Institute of Chemical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALSC	American Lumber Standards Committee
AMA	Acoustical Materials Association
AMCA	Air Movement and Control Association
AMP	National Association of Architectural Metal Manufacturers, Architectural Metal Products Division
ANSI	American National Standards Institute
APA	The Engineered Wood Association
APHA	American Public Health Association
API	American Petroleum Institute
AREA	American Railway Engineering Association
ARI	Air Conditioning and Refrigeration Institute
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society for Non-Destructive Testing
ASQ	American Society for Quality

ASSE	American Society of Safety Engineers
ASTM	American Society for Testing and Materials
AWCI	Association of the Wall and Ceiling Industry
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BAAQMD	Bay Area Air Quality Management District
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association
CBMA	Certified Ballast Manufacturers Association
CDA	Copper Development Association
CEMA	Conveyor Equipment Manufacturers Association
CGA	Compressed Gas Association
CISCA	Ceilings and Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CMAA	Crane Manufacturers Association of America
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
DIN	Deutsches Institut fur Normung eV (German Institute for Standardization)
DIPRA	Ductile Iron Pipe Research Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ETL	Intertek Testing Services, Inc. (formerly ETL Testing Laboratories, Inc.)
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FM	Factory Mutual (FM Global)
FRPI	Fiberglass Reinforced Plastics Institute
FS	Federal Specification
GA	Gypsum Association
GANA	Glass Association of North America
HEW	United States Department of Health, Education and Welfare
HI	Hydraulic Institute

HMI	Hoist Manufacturers Institute
HUD	United States Department of Housing and Urban Development
IBC	International Building Code
ICC	International Code Council
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
IFI	Industrial Fasteners Institute
IRI	Industrial Risk Insurers
ISA	Instrumentation, Systems, and Automation Society (formerly Instrument Society of America)
ISO	Insurance Services Office
ISO	International Organization for Standardization
LPI	Lightning Protection Institute
MIA	Marble Institute of America
ML/SFA	Metal Lath/Steel Framing Association
MS	Military Specifications
MSS	Manufacturers' Standardization Society
MMA	Monorail Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NAPF	National Association of Pipe Fabricators, Inc.
NARUC	National Association of Regulatory Utilities Commissioners
NBHA	National Builders Hardware Association
NBS	United States Department of Commerce, National Bureau of Standards
NCMA	National Concrete Masonry Association
NEC	National Electric Code
NELMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NHPMA	Northern Hardwood and Pine Manufacturers Association
NIST	United States Department of Commerce, National Institute of Standards and Technology

NLGA	National Lumber Grades Authority
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	National Sanitation Foundation
NSSGA	National Stone, Sand, and Gravel Association
NTMA	National Terrazzo and Mosaic Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PEI	Porcelain Enamel Institute
PFI	Pipe Fabrication Institute
PPI	Plastics Pipe Institute
PGMC	Primary Glass Manufacturers Council
PS	Product Standards Section, United States Department of Commerce
RCSC	Research Council on Structural Connections (part of AISC)
RMA	Rubber Manufacturers Association
SAE	Society of Automotive Engineers
SCAQMD	Southern California Air Quality Management District
SCPRF	Structural Clay Products Research Foundation
SCTE	Society of Cable Telecommunications Engineers
SDI	Steel Deck Institute
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturing Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SPI	Society of the Plastics Industry
SPIB	Southern Pine Inspection Bureau
SSPC	Society for Protective Coatings
SWI	Steel Window Institute
TCNA	Tile Council of North America
TEMA	Tubular Exchanger Manufacturers Association
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
UL	Underwriters Laboratories, Inc.
USAB	United States Access Board
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency

USGBC	United States Green Building Council
USGS	United States Geological Survey
USPHS	United States Public Health Service
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association
WCMA	Wood Component Manufacturers Association
WDMA	Window and Door Manufacturers Association
WEF	Water Environment Federation
WWEMA	Water and Wastewater Equipment Manufacturers Association
WWPA	Western Wood Products Association

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 45 29.13

TESTING LABORATORY SERVICES FURNISHED BY CONTRACTOR

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall employ and pay for services of independent testing laboratory to perform specified services.
   2. Inspection, sampling, and testing shall be as specified in the Specifications including but not limited to:
      a. Section 01 45 33, Code-Required Special Inspections and Procedures.
      b. Section 03 00 05, Concrete.
      c. Section 03 01 30, Repair and Rehabilitation of Cast-in-Place Concrete.
      d. Section 03 60 00, Grouting.
      e. Section 04 00 05, Masonry .
      f. Section 05 05 33, Anchor Systems.
      g. Section 05 14 00, Structural Aluminum Framing.
      h. Section 05 31 23, Steel Roof Decking.
      i. Section 09 91 00, Painting.
      j. Section 31 20 00, Earth Moving.
      k. Section 31 63 29, Drilled Concrete Piers.
      l. Section 32 12 00, Flexible Paving.
      q. Section 40 05 05, Exposed Piping Installation.
      s. Other tests indicated in the Contract Documents that are not specifically assigned to others.
   3. CONTRACTOR shall pay for:
      a. Tests not specifically indicated in the Contract Documents as being OWNER's responsibility.
      b. Tests made for CONTRACTOR's convenience.
      c. Repeat tests required because of CONTRACTOR's negligence or defective Work, and retesting after failure of test for the same item to comply with the Contract Documents.
   4. Testing laboratory is not authorized to approve or accept any portion of the Work or defective Work; rescind, alter, or augment requirements of Contract Documents; and perform duties of CONTRACTOR.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM E329, Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
   2. ISO/IEC 17025, General Requirements for the Competence of Testing and Calibration Laboratories.
   3. NIST SRM, Standard Reference Materials.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Testing Laboratory:
      a. Comply with applicable requirements of ASTM E329.
      b. Testing laboratory shall be licensed to operate in the same jurisdiction as the Site. Where applicable, laboratory shall be certified by the authority having jurisdiction for the types of testing required.
      c. Testing equipment used by laboratory shall be calibrated at intervals of not more than twelve months by devices of accuracy traceable to one of the following: NIST SRM, ISO/IEC 17025, certified by state or local bureau of weights and measures, or values of natural physical constants generally accepted in the engineering and scientific community.

1.4 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Quality Control Submittals and Test Reports: Testing laboratory shall promptly submit to CONTRACTOR results of testing and inspections, including:
      a. Date issued.
      b. Project title, number, and name of the Site.
      c. Testing laboratory name and address.
      d. Name and signature of inspector or person obtaining samples.
      e. Date of inspection or sampling.
      f. Record of temperature and weather conditions.
      g. Date of test.
      h. Identification of material or item tested, and associated Specifications Section.
      i. Location in the Project.
      j. Type of inspection or test.
      k. Results of tests and observations regarding compliance with the Contract Documents.
   2. Qualifications Statements:
      a. Testing Laboratory:
         1) Qualifications statement indicating experience and facilities for tests required under the Contract Documents.
         2) Copy of report of inspection of facilities during most recent NIST inspection tour. Include memorandum of remedies of deficiencies reported during inspection.
         3) Copy of certificate of calibration for each instrument or measuring device proposed for use, by accredited calibration agency.

1.5 TESTING LABORATORY DUTIES

A. Testing laboratory shall:
   1. Cooperate with CONTRACTOR and provide qualified personnel promptly on notice.

2. Perform required inspections, sampling, and testing of materials and methods of construction; comply with applicable reference standards and the Contract Documents; and ascertain compliance with requirements of the Contract Documents.
3. Promptly notify ENGINEER and CONTRACTOR of irregularities or deficiencies in the Work that are observed during performance of services.
4. Promptly submit to CONTRACTOR reports of inspections and tests.
5. Perform additional tests and services, as required by CONTRACTOR.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. CONTRACTOR shall:
   1. Cooperate with testing laboratory personnel.
   2. Provide to testing laboratory preliminary representative samples of materials and items to be tested, in required quantities.
   3. Promptly submit to ENGINEER results of tests and inspections received from testing laboratory.
   4. Furnish to laboratory the preliminary design mix proposed for concrete and other material mixes to be tested by testing laboratory.
   5. Provide labor and facilities:
      a. For access to the Work to be tested, and where required, to Suppliers' operations.
      b. For obtaining and handling samples at the Site.
      c. For facilitating inspections and tests.
      d. For testing laboratory's exclusive use for storing and curing of test samples.
      e. Forms for preparing concrete test beams and cylinders.
   6. Notify laboratory and ENGINEER sufficiently in advance of operations to allow assignment of personnel and scheduling of tests.
   7. Arrange with laboratory and pay for additional services, sampling, and testing required for CONTRACTOR's convenience.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

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SECTION 01 45 33

CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to cooperate with the Coordinating Special Inspector and individual special inspectors employed by OWNER, and to perform required testing and inspections. CONTRACTOR shall engage the services of testing agencies as needed to facilitate Special Inspections.
   2. Refer to the Contract Drawings for lists of testing and inspections required.

1.2 DEFINITIONS

A. Coordinating Special Inspector: Professional engineer or architect, hired by OWNER, registered in the same state as the Site, responsible for coordinating and verifying the inspection and testing required by the Statement of Special Inspections included in this Section and reporting to the Building Official.

B. Building Official: Officer or other designated authority having jurisdiction charged with the administration and enforcement of the governing building code, or a duly authorized representative.

C. Special Inspections: Testing and inspection required in Supplement A, Statement of Special Inspections, of this Section.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. OWNER will employ and pay for services of the Coordinating Special Inspector, who will have not less than five years of experience in managing, monitoring, and inspecting building construction.
   2. Inspectors will be qualified in the responsibilities of the Special Inspection for which each is responsible.

B. Regulatory Requirements:
   1. Special Inspections shall be in accordance with applicable building code and other Laws and Regulations, and Supplement A, Statement of Special Inspections, of this Section.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Samples: Representative Samples of materials when required by ENGINEER.

B. Informational Submittals: Submit the following:
   1. Completed Supplement C, Contractor's Statement of Responsibility, as attached to this Section, addressing each system and component indicated on the Contract Drawings and listed in the Quality Assurance Plan portion of Supplement A, Statement of Special Inspections, of this Section.
   2. Completed Supplement D, Fabricator's Certificate of Compliance, as attached to this Section, for fabrication of structural steel.
   3. Site Quality Control Submittals: Material test reports.
   4. Procedure Submittals: List of control procedures within CONTRACTOR's organization for testing, including methods, frequency of reporting, and distribution of testing reports.
   5. Qualifications Statements:
      a. Names and qualifications of each testing agency to be employed, and qualifications of testing agency's personnel that will perform testing as required in Supplement A, Statement of Special Inspections, of this Section.

1.5 CONTRACTOR'S RESPONSIBILITIES

A. Prepare Supplement C, Contractor's Statement of Responsibility, of this Section which shall include:
   1. Acknowledgment of the requirements of the Quality Assurance Plan portion of Supplement A, Statement of Special Inspections, of this Section.
   2. Acknowledgment that necessary quality control shall be exercised in fabricating, handling, and installing to conform to the Contract Documents.
   3. List CONTRACTOR's procedures for ensuring the quality of the Work required for compliance with the Contract Documents relative to each system or component listed in the Quality Assurance Plan portion of Supplement A of this Section.
   4. List personnel who control the quality of the Work relative to the Contract Documents and indicate their position in CONTRACTOR's organization.

B. Employ testing agencies with personnel that comply with qualifications requirements in Supplement A, Statement of Special Inspections, of this Section.

C. Provide safe access to the Work to be tested and inspected.

D. Obtain and handle test samples at the Site.

E. Facilitate inspections and tests.

F. Provide access to Suppliers' and Subcontractors' operations as required.

G. Notify testing agencies, Coordinating Special Inspector, and ENGINEER sufficiently in advance of the Work for the testing agencies, Coordinating Special Inspector, and ENGINEER to coordinate their personnel at the Site. Do not cover the Work to be inspected until Special Inspections have been completed and the results thererof are acceptable.

H. Special Inspections required in this Section do not supersede or make unnecessary inspections and tests required under other Specification Sections or standard inspections required by Laws and Regulations.

1.6 COORDINATING SPECIAL INSPECTOR'S RESPONSIBILITIES

A. Coordinating Special Inspector will:
   1. Hire special inspectors to provide inspections indicated on the Contract Drawings and listed Supplement A, Statement of Special Inspections, of this Section and as required by Laws and Regulations, and laws.
   2. Review testing agencies and testing personnel submitted by CONTRACTOR, relative to compliance with the Contract Drawings and Supplement A, Statement of Special Inspections, of this Section, and in accordance with Laws and Regulations.
   3. Complete Supplement A, Statement of Special Inspections, of this Section to provide names of each inspector and testing agency for each Special Inspection required. Provide Supplement A, Statement of Special Inspections, of this Section to the Building Official, OWNER, ENGINEER, and CONTRACTOR.
   4. Coordinate activities of individual inspectors and testing agencies with CONTRACTOR.
   5. Provide interim reports of inspections and material testing to Building Official, OWNER, ENGINEER, and ENGINEER's consultants, including structural engineer and architect.
   6. To obtain certificate of use and occupancy from the Building Official, complete and provide to the Building Official, OWNER, and ENGINEER Supplement B, Final Report of Special Inspections, of this Section, documenting completion of Special Inspections and correction of discrepancies noted in the Special Inspections.

1.7 INSPECTOR RESPONSIBILITIES

A. Perform specified inspections, sampling, and testing of materials and methods of construction; review and ascertain compliance with Laws and Regulations.

B. Promptly notify Coordinating Special Inspector, OWNER, ENGINEER and CONTRACTOR of irregularities or deficiencies in the Work observed during Special Inspections. Corrective action, if required, will be determined by ENGINEER.

C. Promptly submit two copies of each report of inspections and tests to Coordinating Special Inspector, ENGINEER, and CONTRACTOR including:
   1. Date issued.
   2. Project title and number.

3. Name and signature of inspector.
4. Date of inspection or sampling and test.
5. Record of temperature and weather.
6. Identification of product and Specification Section.
7. Location in Project.
8. Type of inspection or test.
9. Results of inspections and tests, and observations regarding compliance with Laws and Regulations, and standards.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SUPPLEMENTS

A. The supplements listed below, following the "End of Section" designation, are part of this Section:
   1. Supplement A – Statement of Special Inspections
   2. Supplement B – Final Report of Special Inspections
   3. Supplement C – Contractor's Statement of Responsibility
   4. Supplement D – Fabricator's Certificate of Compliance

+ + END OF SECTION + +

Supplement A - Statement of Special Inspections

Project:

Location:

Owner:

Design Professional in Responsible Charge:

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to the Project as well as the name of the Coordinating Special Inspector and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

☐ Structural ☐ Mechanical/Electrical
☐
☐ Architectural Other: _____

The Coordinating Special Inspector shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Inspections listed are periodic unless indicated to be continuous or required by code to be continuous.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: Weekly or ☐ per attached schedule.

Prepared by:

_____
(type or print name)

_____
Signature Date

Design Professional Seal

Owner's Authorization:

_____
Signature Date

Building Official's Acceptance:

_____
Signature Date

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- ☐ Soils and Foundations
- ☐ Cast-in-Place Concrete
- ☐ Precast Concrete
- ☐ Masonry
- ☐ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☐ Spray Fire Resistant Material
- ☐ Wood Construction
- ☐ Exterior Insulation and Finish System
- ☐ Mechanical & Electrical Systems
- ☐ Architectural Systems
- ☐ Special Cases

Special Inspection Agencies	**Firm**	**Address, Telephone, e-mail**
1. **Coordinating Special Inspector**		
2. Inspector		
3. Inspector		
4. Testing Agency		
5. Testing Agency		
6. Other		

Note: The inspectors will be engaged by Owner or Owner's Agent, and not by Contractor or Subcontractor whose Work is to be inspected or tested. Testing agencies shall be engaged and paid for by Contractor. Conflicts of interest must be disclosed to the Building Official prior to commencing the Work.

Quality Assurance Plan

Quality Assurance for Seismic Resistance

Seismic Design Category

Quality Assurance Plan Required (Y/N)

Description of seismic force resisting system and designated seismic systems:

Quality Assurance for Wind Requirements

Basic Wind Speed (three-second gust)

Wind Exposure Category

Quality Assurance Plan Required (Y/N)

Description of wind force resisting system and designated wind resisting components:

Statement of Responsibility

Each contractor responsible for the construction or fabrication of a system or component designated above must submit a Statement of Responsibility.

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspections are subject to the approval of the Building Official. The credentials of all inspectors and testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

When Engineer deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule.

PE/SE	Structural Engineer – a licensed SE or PE specializing in the design of building structures
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III.

International Code Council (ICC) Certification

ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

Exterior Design Institute (EDI) Certification

EDI-EIFS	EIFS Third Party Inspector

Other

_____ _____

Supplement B - Final Report of Special Inspections

Project:

Location:

Owner:

Owner's Address:

Architect of Record:

Structural Engineer of Record:

To the best of my information, knowledge and belief, the Special Inspections required for this project, and itemized in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Special Inspector

(Type or print name)

Signature Date

Licensed Professional Seal

Agent's Final Report

Project:

Agent:

Special Inspector:

To the best of my information, knowledge and belief, the Special Inspections or testing required for this project, and designated for this Agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments:

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Agent of the Special Inspector

(Type or print name)

Signature Date

Licensed Professional Seal or Certification

Supplement C - Contractor's Statement of Responsibility

Each contractor responsible for the construction or fabrication of a system or component designated in the Quality Assurance Plan of Supplement A shall submit a Contractor's Statement of Responsibility.

Project:

Contractor's Name:

Address:

License No.:

Description of designated building systems and components included in the Contractor's Statement of Responsibility:

Contractor's Acknowledgment of Special Requirements

I hereby acknowledge that I have received, read, and understand the Project's seismic requirements, Quality Assurance Plan in Supplement A, and Special Inspection program.

I hereby acknowledge that control will be exercised to obtain conformance with the Contract Documents approved by the Building Official having jurisdiction.

_____ _____

Signature Date

Contractor's Provisions for Quality Control

Procedures for exercising control within the Contractor's organization, the method and frequency of reporting and the distribution of reports are attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement.

Supplement D - Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2 of the International Building Code must submit a *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project:

Fabricator's Name:

Address:

Certification or Approval Agency:

Certification Number:

Date of Last Audit or Approval:

Description of structural members and assemblies that have been fabricated:

I hereby certify that items described above were fabricated in strict accordance with the Contract Documents.

_____ _____
Signature Date

_____
Title

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

SECTION 01 51 05

TEMPORARY UTILITIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all temporary utilities and temporary facilities required for the Project, except those identified in Article 48, "Temporary Service", of the General Clauses.
   2. Provide the following:
      a. Electricity.
      b. Lighting.
      c. Telephone and communications.
      d. Heating, cooling, ventilating, and temporary enclosures.
      e. Water.
      f. Sanitary facilities.
      g. First-aid facilities.
      h. Fire protection.
   3. Make all arrangements with utility owners for temporary utilities and with others as appropriate for temporary facilities. Obtain required permits and approvals for temporary utilities and temporary facilities.
   4. Pay all service costs for utilities and facilities indicated in this Section as CONTRACTOR's responsibility, including cost of electricity, water, fuel, and other utility services and temporary facilities required for the Work.
   5. Continuously maintain adequate temporary utilities and temporary facilities for all purposes for the Project, until removal of temporary utilities and temporary facilities. At minimum, provide and maintain temporary utilities and temporary facilities through Substantial Completion and removal of temporary field offices and sheds unless otherwise approved in writing by ENGINEER.
   6. Maintain, including cleaning, temporary utilities and temporary facilities, and continuously provide consumables as required.
   7. Temporary utilities and temporary facilities shall be adequate for personnel using the Site and the needs of the Project.
   8. Provide temporary utilities and temporary facilities in compliance with Laws and Regulations and, when applicable, requirements of utility owners.

1.2 REQUIREMENTS FOR TEMPORARY UTILITIES AND TEMPORARY FACILITIES

A. Electrical:
   1. Provide temporary electrical service required for the Work, including continuous power for temporary field offices and sheds. Provide temporary outlets with circuit breaker protection and ground fault protection.

2. Owner will supply and pay for the cost of temporary electric power (120 volt, 60 hertz) in accordance with Article 48, "Temporary Service", of the General Clauses

B. Lighting.
   1. Provide lighting at the Site of not less than five foot-candles for open areas and not less than ten foot-candles for stairs and shops. Provide not less than one, 300-watt lamp every 15 feet in indoor work areas. Provide night security lighting of not less than five foot-candles within 50 feet of all parts of the Site during hours of darkness, controlled by photocell.
   2. Do not work in areas with insufficient lighting. Where lighting is insufficient for the work activities to be performed, provide additional temporary lighting.
   3. Provide temporary lighting sufficient for observation of the Work by ENGINEER and inspection by CONTRACTOR and authorities having jurisdiction. Where required by ENGINEER, provide additional temporary lighting.
   4. Provide temporary lighting for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

C. Telephone and Communications.
   1. Provide temporary telephone and communications required for CONTRACTOR's operations at the Site and for summoning emergency medical assistance.
   2. Provide temporary telephone and communications for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

D. Heating, Ventilating, and Enclosures.
   1. Provide sufficient temporary heating, cooling, ventilating, and enclosures to ensure safe working conditions and prevent damage to existing facilities and the Work.
   2. Except where otherwise specified, temporary heating shall maintain temperature of the space served between 50 degrees F and maximum design temperature of building or facility and its contents.
   3. Maintain temperature of areas occupied by OWNER's personnel or electronic equipment, including offices, lunch rooms, locker rooms, toilet rooms, and rooms containing computers, microprocessors, and control equipment, between 65 degrees F and 80 degrees F with relative humidity less than 75 percent.
   4. Required temperature range for storage areas and certain elements of the Work, including preparation of materials and surfaces, installation or application, and curing as applicable, shall be in accordance with the Contract Documents for the associated Work and the Supplier's recommended temperature range for storage, application, or installation, as appropriate.
   5. Provide temporary ventilation sufficient to prevent accumulation in construction areas and areas occupied by OWNER of hazardous and nuisance levels or concentrations of dust and particulates, mist, fumes or vapors, odors, and gases, associated with construction.

6. Provide temporary enclosures and partitions required to maintain required temperature and humidity.
7. Provide temporary heating, ventilating, and cooling for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

E. Water:
   1. General:
      a. Owner will provide and pay for the cost of temporary water in accordance with Article 48, "Temporary Service", of the General Clauses.
      a. Provide temporary water facilities including piping, valves, meters if not provided by owner of existing waterline, backflow preventers, pressure regulators, and other appurtenances. Provide freeze-protection as required.
      b. Continuously maintain adequate water flow and pressure for all purposes during the Project, until removal of temporary water systems.
   2. Water for Construction Purposes:
      a. Provide water for Site maintenance and cleaning and, water necessary for construction activities, and water for disinfecting and testing of systems.
      b. CONTRACTOR may use existing hose bibbs for short-term wash-downs and intermittent use of water for work areas in the existing building. Obtain consent of ENGINEER and OWNER if connections to existing hose bibbs and similar existing connections will be used for more than one day at a time.
   3. Water for Human Consumption and Sanitation:
      a. Provide potable water in accordance with Laws and Regulations for consumption by personnel at the Site, for field offices, and for sanitary facilities.
      b. When necessary, provide bottled, potable water for use and consumption by personnel at the Site, including CONTRACTOR, ENGINEER, and visitors to the Site.
      c. Provide temporary water for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

F. Sanitary Facilities.
   1. Provide suitably-enclosed chemical or self-contained toilets for CONTRACTOR's employees, Subcontractors, Suppliers, ENGINEER, and visitors to the Site. Location of temporary toilets shall be acceptable to OWNER and ENGINEER.
   2. Refer to Paragraph 1.2.E of this Section for requirements for water intended for human consumption during construction.
   3. Provide suitable temporary washing facilities for employees and visitors.
   4. Provide temporary sanitary facilities for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

G. First-aid Facilities.

1. Provide temporary first-aid stations at or immediately adjacent to the Site's work areas, and inside CONTRACTOR's temporary field office. Locations of first-aid stations shall be determined by CONTRACTOR's safety representative. Replenish supplies in first-aid stations as items are used, prior to expiration of items, and as necessary. Monitor and log inventory of supplies in first-aid stations in accordance with requirements for monitoring and logging safety equipment as indicated in Section 01 35 23, Safety Requirements.
2. Provide list of emergency telephone numbers at each hardwired telephone at the Site. List shall be in accordance with the list of emergency contact information required in Section 01 35 23, Safety Requirements.
3. Provide temporary first-aid facilities for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

H. Fire Protection.
1. Provide temporary fire protection, including portable fire extinguishers rated not less than 2A or 5B in accordance with NFPA 10, Portable Fire Extinguishers, for each temporary building and for every 3,000 square feet of floor area under construction.
2. Provide Class A (ordinary combustibles), Class B (combustible liquids and gases), and Class C (electrical equipment) fire extinguishers as necessary.
3. Comply with NFPA 241, Standard for Safeguarding Construction, Alternation, and Demolition Operations, and requirements of fire marshals and authorities having jurisdiction at the Site.
4. Provide temporary fire protection for ENGINEER's field office in accordance with Section 01 52 11, Engineer's Field Office.

1.3 USE OF OWNER'S SYSTEM

A. Use of Permanent Utility Systems Provided Under the Project:
1. Permanent electrical, lighting, water, heating, ventilating, and fire protection systems and first-aid facilities may be used to provide temporary utilities and temporary facilities if the following are met:
a. Obtain OWNER's written permission to use permanent systems.
b. Permanent systems to be used for temporary utilities or temporary facilities shall be substantial complete, including complete functionality of all controls.
c. CONTRACTOR shall pay all costs while using permanent system, including operation, maintenance, replacement of consumables, and provide replacement parts.
2. Do not use the following permanent facilities:
a. Telephone and communication facilities.
b. Sanitary facilities.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for temporary utilities and temporary facilities may be new or used, but shall be adequate for purposes intended and shall not create unsafe conditions, and shall comply with Laws and Regulations.

B. Provide required materials, equipment, and facilities, including piping, cabling, controls, and appurtenances.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install temporary utilities and temporary facilities in neat, orderly, manner, and make structurally, mechanically, and electrically sound throughout.

B. Location of Temporary Utilities and Temporary Facilities:
   1. Locate temporary systems for proper function and service.
   2. Temporary systems shall not interfere with or provide hazards or nuisances to: the Work under this and other contracts, movement of personnel, traffic areas, materials handling, hoisting systems, storage areas, finishes, and work of utility owners and others.
   3. Do not install temporary utilities on the ground, with the exception of temporary extension cords, hoses, and similar systems in place for short durations.

C. Modify and extend temporary systems as required by progress of the Work.

3.2 USE

A. Maintain temporary systems to provide safe, continuous service as required.

B. Properly supervise operation of temporary systems:
   1. Enforce compliance with Laws and Regulations.
   2. Enforce safe practices.
   3. Prevent abuse of services.
   4. Prevent nuisances and hazards caused by temporary systems and their use.
   5. Prevent damage to finishes.
   6. Ensure that temporary systems and equipment do not interrupt continuous progress of construction.

C. At end of each work day, check temporary systems and verify that sufficient consumables are available to maintain operation until work is resumed at the Site. Provide additional consumables if the supply on hand is insufficient.

3.3 REMOVAL

A. Completely remove temporary utilities, temporary facilities, equipment, and materials when no longer required. Repair damage caused by temporary systems and their removal and restore the Site to condition required by the Contract Documents; if restoration of damaged areas is not specified, restore to preconstruction condition.

B. Where temporary utilities are disconnected from existing utility, provide suitable, watertight or gastight (as applicable) cap or blind flange, as applicable, on service line, in accordance with requirements of utility owner.

C. Where permanent utilities and systems were used for temporary utilities, upon Substantial Completion replace all consumables such as filters and light bulbs and parts used during the Work.

+ + END OF SECTION + +

SECTION 01 51 41

TEMPORARY PUMPING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for temporary pumping at facilities, such as treatment plants and pumping stations.
   2. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals shown, specified, and required for temporary pumping and handling of fluids during the Project. The following temporary pumping systems shall be provided:
      a. Primary Temporary Pumping System – This system generally includes the following:
         1) One primary electrically driven submersible or self-priming suction lift pump.
         2) One standby electrically driven submersible or self-priming suction lift pump (to be stored on site).
         3) One standby diesel generator equipped with automatic transfer switch.
         4) Dialer to send high level alarms and power failure to WCDEF SCADA system and CONTRACTOR 24-hour emergency contact.
         5) Required pump control panels and field instruments for pump operations and alarm indication.
      b. Secondary Temporary Pumping System – This system generally includes the following:
         1) One automatic self-priming backup diesel pump piped into the discharge piping.
         2) Integrated into the Primary Temporary Pumping System controls and dialer.
   3. Design, provide, and maintain temporary pumping systems, including plugs, bulkheads, and line stops as required; pumps; piping, supports, and valves; temporary instrumentation and control systems; fuel and electricity; personnel; and appurtenances. Comply with Laws and Regulations and requirements of authorities having jurisdiction. System shall be suitable for its service and operating environment.
   4. Required capacity of temporary pumping systems is specified herein. Provide temporary pumping system of required capacity with not less than the largest pump out of service.
   5. Location of the temporary pumping system shall not affect OWNER's or facility manager's operations and access at the Site, and public access to streets and drives, unless approved by ENGINEER and authorities having jurisdiction.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate Work that will be performed with or before Work specified in this Section.

C. Related Sections:
   1. Section 01 14 16, Coordination with Owner's Operations.
   2. Section 40 05 76.23, Piping Specialties.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. Temporary Pumping System Supplier:
      a. Supplier shall have not less than five years of experience providing temporary pumping systems similar in size or larger than those required for the Project.
      b. Upon request, submit evidence of providing not less than five temporary pumping systems on other projects similar in size (or larger) and similar in service to temporary pumping systems required for the Project.

B. Component Supply and Compatibility:
   1. Obtain each temporary pumping system from a single Supplier who shall be responsible for providing a complete system.

C. Regulatory Requirements:
   1. Secondary containment for fuel tanks shall be in accordance with Laws and Regulations. Include temporary fuel tanks in spill prevention control and countermeasures evaluation and plan.
   2. Leakage from temporary pumping system or improper discharge is not allowed.
   3. Quality of exhaust emissions from internal-combustion engines associated with temporary pumping systems shall comply with Laws and Regulations, including applicable air permits. Before furnishing temporary pumping system, verify compliance with air quality standards and provide temporary emissions controls to comply with such standards when required.

1.3 SUBMITTALS

A. Timing: Furnish to ENGINEER submittals for temporary pumping system not less than 60 days prior to delivery of temporary pumping system to the Site.

B. Action Submittals: Submit the following:
   1. Temporary Pumping System Submittal: Submit the following for each temporary pumping system:
      a. System curve of flow plotted against total dynamic head, and calculations that substantiate the proposed temporary pumping system,

including comparison of net positive suction head required and net positive suction head available.

b. Manufacturer's data and specifications on each type and size of pump proposed and its capacity, including pump curves.

c. Manufacturer's data and specifications for engines and other equipment required for temporary pumping system, including expected exhaust emissions data.

d. Technical information and specifications on noise controls for noise-emitting equipment.

d. Technical data on temporary piping, pipe joints, valves, pipe supports, controls, flow meter, secondary containment for fuel tanks, emissions controls when required, and other information pertinent to the temporary pumping system.

e. Layout Drawings:

1) Sketches showing proposed layout of temporary pumping system, including locations of temporary plugs, bulkheads, and line stops; suction and discharge locations; location of pumps and associated piping and valves; and source of power for temporary pumping system. Sketches shall be scale drawings acceptable to ENGINEER, and shall include site plans similar to those in the Contract Documents.

2) Details of system suction and discharge locations. Discharge details shall include measures to protect the receiving structure and dissipate energy.

3) Where temporary lines will be buried, submit trench details. Submit sketches and information on other types of protection proposed for temporary piping.

f. Temporary Plugs, Bulkheads, and Line Stops: Manufacturer's literature and fabrication drawings showing type of plug, bulkhead or line stop as applicable, materials, and hydrostatic head the plug, bulkhead, or line stop is designed to withstand. Submit complete technical information for CONTRACTOR-proposed line stops, installation procedures, name of proposed line stop installer, and documentation of experience on at least five similar projects.

g. Narrative describing proposed operation of temporary pumping system, including who will operate system, staffing, planned frequency of fueling, contingency plan in event of pump failure, and statement of existing systems that may be affected during operation of temporary pumping system.

C. Informational Submittals: Submit the following:

1. Schedule for Temporary Pumping for Facilities:

a. Schedule for each temporary pumping system. Include dates of mobilizing each temporary pumping system, testing, starting and ending dates of temporary pumping, and demobilizing each temporary pumping system.

b. At CONTRACTOR's option, such information may be included on the Progress Schedule prepared and maintained in accordance with Section 01 32 16, Progress Schedule. When such option is exercised, however, upon request of ENGINEER break out as separate sub-schedule the schedule of temporary pumping in collection system and furnish to ENGINEER.

c. Maintain and update schedule for temporary pumping for collection system, and submit updated schedules in accordance with requirements for updating the Progress Schedule as indicated in Section 01 32 16, Progress Schedule.

2. Qualifications Statements:
   a. Qualifications of temporary pumping system Supplier.

PART 2 – PRODUCTS

2.1 PERFORMANCE CRITERIA

A. General:
   1. System components shall be suitable for continuous operation with the fluid pumped.
   2. Noise Controls: Provide noise controls for temporary pumping system. Noise emitted from temporary pumping system shall comply with Laws and Regulations and shall not exceed 70 db at a distance of thirty feet from noise source.
   3. Fuel-consuming temporary pumping system components intended for use when CONTRACTOR is not present shall include fuel tanks sized for not less than 24 hours of uninterrupted operation at system's operating capacity, and means to automatically notify CONTRACTOR upon high and low suction water level and low fuel level.

B. Pump Design Criteria:
   1. Temporary pumping systems shall meet the following design criteria:

	Parameter	**Value**
a.	Suction location:	Influent manhole or Wet Well (as determined by CONTRACTOR)
b.	Discharge location:	As determined by CONTRACTOR
c.	Pumped fluid:	Municipal wastewater
d.	Minimum solids passing:	3-inch sphere
e.	Pump capacity:	1,400 gpm
f.	Minimum static head:	33 feet
g.	Minimum dynamic head (through existing force main):	4.5 feet
h.	Total dynamic head	To be determined by CONTRACTOR to include temporary piping, valves, and fittings

i.	Maximum suction lift:	25 feet

2.2 SUPPLIERS

A. Temporary pumping system to be provided by:
   1. Godwin Pumps.
   2. Or equal.

2.3 TEMPORARY PUMPING SYSTEM

A. Pumps:
   1. Provide fully automatic self-priming pumping units that do not require the use of foot valves or vacuums pumps in the priming system.

B. Instrumentation and Controls:
   1. Provide temporary pumping system with flow meter acceptable to ENGINEER and suitable for pumped fluid, pipe material, and hydraulic conditions. Flow meter shall provide accurate flow measurement and include local display of flow rate in gallons per minute or million gallons per day as required, and be capable of providing 4 to 20 mA dc output signal for flow rate.
   2. Controls: Provide controls for temporary pumping system to maintain a liquid level in the influent structures that does not result in flow backups and that does not adversely affect the OWNER's system and private property.

C. Temporary Piping System:
   1. Piping shall be steel, ductile iron, high density polyethylene, or other material accepted by ENGINEER, and suitable for system operating pressures. Aluminum piping and PVC piping not mechanically restrained are not allowed. Durable hoses can be used only for short sections and with acceptance by ENGINEER.
   2. Piping system shall have watertight joints of the following types: fused joints, restrained couplings, flanged coupling adapters, quick-connects by Camlok or equal, flanged joints, grooved and shouldered end-type couplings, and other watertight joints accepted by ENGINEER.
   3. Size discharge piping for flow velocity of not more than 10 feet per second.
   4. Provide check valves or approved pump control valves as required.
   5. Provide air valves on discharge piping as required. Air valves shall expel air upon pipe filling and admit air upon pipe dewatering, and release small quantities of entrained air during operation. Air valves shall be suitable for service with the pumped fluid.
   6. Discharge from temporary pumping system shall not adversely affect the existing process or facilities. Provide energy-dissipating measures at discharge point as necessary.

D. Temporary Plugs, Bulkheads, and Line Stops:

1. Acceptable temporary plugs and bulkheads include inflatable dams specifically designed for such service, brick bulkheads, timber bulkheads, sandbags, and other bulkhead methods suitable for the service and conduit conditions. Line stops, where required, are specified in Division 40 of the Contract Documents.
2. Each plug, temporary bulkhead, and line stop shall be suitable for the maximum pressure encountered.
3. Where temporary plugs and bulkheads are under pressure or surcharged, provide either two plugs or a plug and temporary bulkhead.
4. Provide line stops and tapping sleeves and valves in accordance with Section 40 05 76.23, Piping Specialties, as required to connect to the existing force main piping.

PART 3 – EXECUTION

3.1 PREPARATION

A. General:
1. Temporary piping shall be located off of roads, driveways, and sidewalks. Piping shall not be located in environmentally-sensitive areas such as wetlands.
2. Where required for OWNER's access to and operation of existing facilities, bury temporary piping that would otherwise inhibit access to processes, buildings, structures, streets, and driveways. In paved areas, provide temporary surfacing, sufficient for AASHTO H-20 wheel loads over buried temporary piping.
3. Hydrostatic Testing of Temporary Piping System:
   a. Perform successful hydrostatic testing of temporary piping system using clean water at pressure equal to 1.2 times highest expected system operating pressure, for one hour while maintaining test pressure within 3.0 psig of required test pressure.
   b. ENGINEER will witness hydrostatic test.
   c. Hydrostatic test criteria for acceptance: No leakage.
4. Verify that entire temporary pumping system is ready for operation before commencing shutdown of OWNER's operations, facility, or systems. Verify that temporary pumping system controls and flow meter are properly connected and functional.

3.2 TEMPORARY PUMPING

A. During Operation of the Temporary Pumping System:
1. Temporary pumping system shall operate continuously. In the event of equipment failure, immediately make repairs or replace equipment. Provide spare parts and redundant units as necessary for continuous operation.
2. Provide personnel to monitor, operate, and maintain temporary pumping system twenty-four hours per day when system is in service.

3.3 DEMOBILIZATION

A. Upon Conclusion of Temporary Pumping:
   1. Remove plugs, bulkheads, and line stops in manner that allows flow to slowly return to normal, without surging, surcharging, and adverse effects on existing system.
   2. Flush out temporary pumping system with clean water discharged to an appropriate location.
   3. Remove temporary pumping system and appurtenances from the Site.
   4. When CONTRACTOR has obtained permit(s) for temporary pumping from authorities having jurisdiction, furnish written notice to such authorities that temporary pumping has been completed.

+ + END OF SECTION + +

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SECTION 01 52 11

ENGINEER'S FIELD OFFICE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for CONTRACTOR-provided field office, with furnishings, equipment, and consumables, for use by ENGINEER.
   2. CONTRACTOR shall provide and maintain field office for ENGINEER's sole use. Provide field office at location approved by ENGINEER, near CONTRACTOR's field office.
   3. Field office shall be complete and fully functional within 14 days after date on which the Contract Times commence running.
   4. Obtain required permits for field offices.

1.2 SUBMITTALS

A. Action Submittals: Obtain ENGINEER's approval of the following prior to staging field office to the Site:
   1. Field Office Submittal: Submit all of the following as one submittal which shall include:
      a. Site plan indicating proposed location of field office, parking for field office, facilities related to the field office, and material of both field office parking and sidewalk or walkway to field office.
      b. Information on proposed field office size, construction, exterior appearance, interior finishes, and field office security measures.
      c. Proposed layout of field office interior, showing location of offices, common areas, restroom, closet, other areas specified (if any), with dimensions indicated for each.
      d. Proposed layout of field office exterior identifying sign, showing all text, font, colors, and graphics (if any).
      e. Proposed type of Internet service; name of proposed Internet service provider; and product data and technical information on equipment (if any) required for Internet service.
      f. Office Equipment: Product data and technical information for copier, telephones, and other office equipment.
      g. Computer System: Product data and technical information on the complete computer system.
      h. Digital Camera: Product data and technical information on camera and accessories.

PART 2 – PRODUCTS

2.1 FIELD OFFICE CONSTRUCTION AND SITE REQUIREMENTS

A. Site at Field Office:
   1. Allocate total of one reserved parking spaces for use by ENGINEER and OWNER in close proximity to ENGINEER's field office. Parking area shall be paved with bituminous paving, concrete, crushed stone, or other material approved by ENGINEER. Parking area shall be suitably drained and free of standing water during wet weather.
   2. Provide sidewalk or walkway, not less than four feet wide, of bituminous pavement, concrete, crushed stone, or other material approved by ENGINEER, for the full distance between parking area and field office.

B. Field Office, Minimum Construction: Field office shall comply with the following:
   1. Structurally sound foundation and superstructure.
   2. Size: Floor area of not less than 128 square feet, and not less than 8 feet wide.
   3. Completely weather-tight and insulated, with minimum R-19 insulation.
   4. Exterior finish approved by ENGINEER.
   5. New interior finishes approved by ENGINEER, including resilient floor covering in first-class condition.
   6. Field Office Ingress and Egress:
      a. Two doors for ingress and egress for each field office unit, each with landing, stairs, and railing complying with building codes and other Laws and Regulations in effect at the Site.
      b. Landing and stairs shall have slip-resistant walking surfaces, and be metal, pressure-treated wood, fiberglass, or concrete.
      c. Railing shall be metal, wood, or fiberglass.
      d. Door Security:
         1) Doors shall be secure and lockable.
         2) Furnish each door with suitable, lockable security bar. Security bar shall be Master Lock 265DCCSEN Dual-Function Security Bar, or equal.
   7. Windows:
      a. Window area equal to not less than ten percent of floor area.
      b. Windows shall each have insect screen and operable sash.
      c. Provide each window with lock and exterior security bars approved by ENGINEER.
   8. One lockable area for storage.
   9. Keys:
      a. Furnish to ENGINEER two identical sets of keys suitable for operating all keyed locks, including ingress/egress door locks, security bars for doors, window locks, closets, and office furnishings.
      b. Permanently label each key to indicate its associated lock.
   10. Restroom:

a. Provide in field office one private restroom including one lavatory, one toilet, medicine cabinet with mirror, soap dispenser, and paper towel holder.
b. Provide each restroom with appropriate electric ventilation fan with positive discharge to location outside the field office.

11. Kitchen Area:
    a. Field office shall include kitchen area suitable for the specified appliances, coffee maker, and drinking water supply.
    b. Provide kitchen area with electrical service and electrical receptacles and circuits appropriate for appliances specified in this Section. Provide not less than one light fixture in kitchen area.
12. Exterior Sign:
    a. Field office identifying exterior sign, approved by ENGINEER. Sign shall be durable, weatherproof, suitable for long-term exposure to sunlight.
    b. Exterior sign shall be not less than 1.5 feet high by four feet wide, installed at location determined in field and acceptable to ENGINEER.
    c. Sign shall be in color, as presented in the layout below.
    d. Sign layout and general proportions shall be as presented below. Text of first line and last line shall be Arial. Text size and size of graphic shall be proportionate to the graphic below. ENGINEER will furnish graphic as JPG file for use by CONTRACTOR in preparing the sign.

C. Field Office Optional Construction:
1. Provide mobile office trailer in first-class condition approved by ENGINEER, specifically designed for use as construction field office and complying with requirements of this Section.
2. Provide skirting around perimeter of each mobile field office trailer.
3. Supplier: Provide field office by one of the following:
    a. Pac-Van, Inc.
    b. Modular Space Corporation (ModSpace).
    c. Williams Scotsman, Inc.
    d. Or equal.

2.2 FIELD OFFICE UTILITIES

A. Comply with Section 01 51 05, Temporary Utilities.

B. Provide the following for the ENGINEER's field office:
   1. Electrical System and Lighting:
      a. Electric service as required, including paying all costs. Provide electrical submeter if electrical service is obtained from OWNER's system.
      b. Interior lighting of not less than 50 foot-candles at desktop height.
      c. Minimum of eight 120-volt, wall-mounted, duplex convenience electrical receptacles.
      d. Exterior, wall-mounted lighting at each entrance to field office, not less than 250 watts each.
   2. Heating, Ventilating, and Air Conditioning System:
      a. Provide automatic heating to maintain indoor temperature in field office of not less than 65 degrees F in cold weather. Furnish all fuel and pay all utility costs.
      b. Automatic cooling to maintain indoor temperature in field office of not warmer than 75 degrees F in warm weather.
   3. Water and Sewerage:
      a. Provide potable water service for each plumbing fixture associated with field office.
      b. Provide sanitary sewerage for each lavatory/sink and toilet.
      c. Utility Connections – General:
         1) Comply with Laws and Regulations, including plumbing and sewer codes, and requirements of authorities having jurisdiction.
         2) Protect plumbing from freezing.
      c. Potable Water Service: Provide the following:
         1) Type K copper waterline from potable water main to each plumbing fixture.
         2) Reduced pressure zone (RPZ)-type backflow preventer in accordance with Laws and Regulations and requirements of authorities having jurisdiction.
         3) Provide 15-gallon electric hot water tank or tankless hot water heater, and hot water piping to serve each lavatory/sink in field office.
         4) Not less than one exterior hose bibb, with not less than 50 feet of hose, located adjacent to field office sidewalk or walkway, near field office ingress/egress doors. Provide wall-mounted hose reel or hose caddy.
         5) Before placing potable water system into service, disinfect piping and appurtenances in accordance with Laws and Regulations.
      d. Sanitary Sewerage:
         1) Provide PVC or other appropriate piping, arranged in accordance with Laws and Regulations, to convey wastewater from field office to sanitary sewer that discharges to a permitted wastewater treatment facility, or to holding tank provided by CONTRACTOR.
         2) When holding tank is provided, also provide pumping and disposal of holding tank contents at appropriate, regular intervals.
   4. Telephone Service:

a. Cellular Telephones and Service: ENGINEER will provide cellular telephones and service for ENGINEER's employees assigned to the field office.

5. Internet Access:
   a. Obtain and pay for Internet service until removal of the field office, with unlimited (untimed) Internet access, for ENGINEER's sole use.
   b. Set up system and appurtenances required and verify functionality in the field office.
   c. Internet service shall be one of the following, listed in order of preference; provide a lower type of access only when the next-higher level is unavailable:
      1) Fiber-optic or Cable Provider Service:
         a) Provide service via communication service provider via either cable or fiber-optic service at download speed of not less than 15 megabytes per second (Mbps) and upload speed of not less than 1 Mbps.
         b) Provide appropriate modem, cabling, and appurtenances.
      2) DSL:
         a) Provide service via symmetrical digital subscriber line with download speed of not less than 1.5 Mbps and upload speed of not less than 384 kilobits per second (Kbps).
         b) Provide dedicated telephone line for Internet access.
         c) Provide DSL filters on each non-DSL outlet in the field office telephone system.
      3) Mobile Broadband Wireless:
         a) Provide mobile broadband wireless 4G network by AT&T, Verizon, Sprint, T-Mobile, or equal, with download speed of not less than 37 Mbps and upload speed of not less than 17 Mbps.
         a) Provide mobile broadband wireless router. Product and Manufacturer: Linksys Wireless-G Router for Mobile Broadband, or equal.
         b) Mobile broadband air-card for field office. Product and Manufacturer: Sierra Wireless 597E, Novatel Merlin EX720, or equal.
         c) Router and air-card will remain CONTRACTOR's property upon removal of field office from the Site.
      4) Satellite:
         a) Provide 4G network service with download speed of not less than 12 Mbps.
         b) Provide required equipment, including outdoor unit (dish) and indoor satellite modem equipment, together with required cabling.
         c) Provide telephone modem in computer, together with telephone line and service, for file uploading.

C. Should actions of utility companies delay the complete set up of field office, CONTRACTOR shall provide temporary electricity, heat, water supply, sanitary facilities, and telephone service as required at no additional cost to OWNER.

2.3 FURNISHINGS AND EQUIPMENT

A. Provide the following furnishings and equipment:
   1. Desks: One 5-drawer desks, each with desktop surface five feet long by 2.5 feet wide with not less than one file drawer per desk, suitable for storing 8.5-inch by 11-inch documents.
   2. Desk Chairs: One new or used (in good condition) five-point, high backed, cushioned swivel chairs with seat-height adjustment.
   3. Other Chairs: Three side chairs with arm rests and padded seats and backs, and four metal folding chairs without arm rests.
   4. One new or used (in good condition) folding tables each eight feet long by 2.5 feet wide.
   5. Two new or used (in good condition) folding tables each four feet long by 2.5 feet wide.
   6. Plan rack(s) to hold not less than eight sets of the Drawings.
   7. One 4-drawer file cabinet.
   8. Two polyethylene waste baskets, each with capacity of not less than seven gallons.
   9. Suitable doormat at each exterior ingress/egress door.
   10. One cork tack-boards, each 2.5 feet by three feet, with thumbtacks.
   11. One white board for use with dry markers, approximately six feet by four feet, with marker holding tray, installed by CONTRACTOR at location directed by ENGINEER in the field office. Furnish supply of colored markers and eraser for the white board.
   13. Safety Equipment: Provide the following:
      a. Fire extinguishers with associated signage.
      b. Smoke detector with supply of batteries.
      c. Carbon monoxide detector with power supply.
      d. Provide in accordance with Laws and Regulations. For each field office structure, provide not less than two wall-mounted fire extinguishers, one battery-operated ceiling-mounted smoke detector, and one carbon monoxide detector suitably installed.
   14. First-Aid Station:
      a. In addition to first-aid stations otherwise required by the Contract Documents, provide for ENGINEER's sole use a first-aid station in ENGINEER's field office.
      b. Product and Manufacturer: Zee Medical USA, Item 0152, "Medium Four-Shelf Plastic Cabinet", www.zeemedical.com; or equal.
   15. Temperature and Humidity Monitor:
      a. Sensor installed outdoors in shade, display installed inside field office.
      b. Unit shall display daily minimum and maximum temperature and current temperature, and be capable of displaying daily minimum and maximum

relative humidity and current relative humidity, and have audible alarm and adjustable alarm setpoints.

c. Manufacturer and Product: Provide Fisher Scientific "Traceable Remote Alarm RH/Temperature Monitor" Catalog No. 14-649-84; or equal.

d. Provide batteries for unit as required.

16. Personal Protective Equipment for Visitors: Furnish the following:
    a. Protective Helmets (Hard Hats): Four, each with full brim, of fiberglass or thermoplastic; each with ratchet suspension; white in color.
    b. Safety Glasses: Four, each with clear lenses, polycarbonate, anti-fog and anti-scratch coating, suitable to fit over personal eyewear.
    c. Reflective Safety Vest: Four, each of polyester mesh or other material acceptable to ENGINEER, color to be high-visibility orange, with one-inch-wide reflective tape, one-size-fits-all design.
    d. Earplugs: Supply of foam, disposable earplugs. Promptly resupply when stock is depleted.
17. Two electric clocks.
18. One electric coffee maker, with ten-cup capacity or larger.
19. Bottled water with electric cooler dispenser for five-gallon bottles, with cup dispenser.
20. Computer System:
    a. Computer: ENGINEER will furnish computers and software required for ENGINEER's personnel assigned to the field office.
    b. Printer/Copier/Scanner:
        1) System Description: Provide one inkjet printer/copier/scanner with color printing capability.
        2) Manufacturer and Model: Provide one of the following:
            a) Brother Printer MFC J5720DW Wireless Color Inkjet All-in-One Printer.
            b) Canon PIXMA iX6820 Inkjet Business Printer.
            c) Or equal.
        3) Sheet Size: Capable of printing 8.5-inch by 11-inch, 8.5-inch by 14-inch, and 11-inch by 17-inch sheets.
        4) Printing Speed: 20 pages per minute (black and white), 18 pages per minute (color).
        5) Scanning: Capable of scanning to PDF and JPG files, selectable by the user.
        6) Ink Cartridges: Provide all cartridges required for full-color printing, and promptly replace cartridges as needed throughout the Project.
    b. Wireless Router:
        1) Provide wireless router to be configured by ENGINEER.
        2) Router capacity shall be not less than 54 Bbps.
        3) Manufacturer: Router shall be Linksys, or equal.
21. Copier: Furnished under the "Computer System" paragraph, above.
22. Digital Camera:
    a. Furnish one point-and-shoot digital still camera with built-in flash for use by ENGINEER for duration of the Project.
    b. Manufacturer and Product: Furnish one of the following:

1) Canon PowerShot A1300 16.0 MP Digital Camera.
2) Nikon COOLPIX S33 Waterproof Digital Camera.
3) Or equal,

c. Camera shall have not less than 4x optical zoom, 13.0 megapixel resolution, equipped with 2.7-inch low temperature polycrystalline silicon color LCD. Camera shall be capable of shooting 720 dpi digital video.

d. Furnish compatible USB type interface cable and software necessary to download photographs from camera to ENGINEER's computer.

c. Appurtenances: Furnish the following with each camera:
1) One 8-GB memory card compatible with camera.
2). Four nickel-cadmium rechargeable batteries suitable for camera, with charger.

23. Kitchen Area Appliances: Provide the following in the field office kitchen area:
a. One new, frost-free, refrigerator-freezer, with capacity of not less than 2.5 cubic feet.
b. One new microwave oven, not less than 1.2 cubic foot size.
c. Kitchen area appliances will remain property of CONTRACTOR upon removal of field office."

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install field office and related facilities in accordance with Laws and Regulations.

B. Install materials and equipment, including prefabricated structures, in accordance with manufacturer's instructions, and to provide optimal performance and accuracy.

3.2 CLEANING, MAINTENANCE, AND SUPPLIES

A. Furnish the following maintenance services:
1. Immediately repair malfunctioning, damaged, leaking, or defective field office structure, site improvements, systems, and equipment.
2. Provide computer supplies and pay for maintenance on CONTRACTOR-furnished computer system and copier.
3. Promptly provide snow and ice removal for ENGINEER's field office, including parking area, walkways, and stairs and landings.
4. Provide continuous maintenance and janitorial service of field office and sanitary facilities. Clean field office not less than once per week Sweep or vacuum field office not less than daily, or more-frequently when site conditions are such that dirt or mud is frequently tracked into field office. Clean and wax (as appropriate) flooring every six months.
5. Waste Disposal:
a. Properly dispose of trash and waste as needed, not less than twice per week.

b. Properly handle and dispose of recyclables. Do not dispose of recyclables as trash.
c. Dispose of other waste, if any, as required, to avoid creation of nuisances and adverse environmental effects. Properly dispose of electronic waste, when necessary, at proper waste receiving facility.

B. Consumables: Provide the following consumables as needed:
1. Toner and ink cartridges for printers and copier, as required.
2. Paper supplies for printer and copier. Always maintain in field office not less than one ream of each size of paper for which printer and copier are capable.
3. Dry markers in six colors and white board eraser set. Replace markers when exhausted or lost.
4. Bottled water suitable for water dispenser and disposable cups.
5. Coffee supplies, including coffee, filters, cups, sugar, creamer, and stir-sticks.
6. Hand-soap, paper towels, toilet paper, cleansers, and janitorial implements, including broom.
7. Batteries for smoke detector and other battery-powered items furnished by CONTRACTOR.
8. Replace fire extinguishers upon expiration.
9. Not less-often than monthly, inspect first-aid kit and inventory items consumed or used and remove items that are at or near their expiration date. Promptly replace and restock consumed and expired items.

3.3 REMOVAL

A. Remove field office and furnishings when directed by ENGINEER, prior to inspection for final completion. Deliver specified equipment to OWNER.

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SECTION 01 52 13

CONTRACTOR'S FIELD OFFICE AND SHEDS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide a temporary field office for CONTRACTOR's use with not less than the minimum facilities specified.
   2. Provide required temporary storage and work sheds.
   3. Obtain and pay for required permits and utilities. Field offices and sheds shall comply with Laws and Regulations.

B. Coordination:
   1. Coordinate with OWNER, facility manager, other contractors, and others using the Site the location of field offices and sheds, including contracts indicated in Section 01 11 13, Summary of Work.

C. Location:
   1. Locate field offices and sheds in accordance with the Contract Documents and in accordance with the Site mobilization discussions at the preconstruction conference.

D. Furnish in CONTRACTOR's field office one complete set of the Contract Documents for ready reference by interested persons. In addition to the reference set, comply with Section 01 78 39, Project Record Documents and related provisions of the General Clauses.

PART 2 – PRODUCTS

2.1 FIELD OFFICE AND SHEDS – FURNISHINGS, AND EQUIPMENT

A. Contractor's Field Office and Furnishings:
   1. Construction: As required by CONTRACTOR.
   2. Utilities and Services: Provide the following:
      a. Telephone service.
      b. Computer network and related facilities as required for CONTRACTOR's needs.
      c. Utilities and related facilities for lighting and maintaining temperature, in accordance with Section 01 52 11, Engineer's Field Office.
   3. Furnishings:
      a. Furnishings required by CONTRACTOR.

4. Provide on field office's exterior an identification sign displaying CONTRACTOR's company name. Maximum size of sign shall be four feet by eight feet. Sign shall be suitable for outdoor use for the duration of the Project.
5. Furnish and maintain at CONTRACTOR's field office 12 protective helmets ('hard hats") for use by visitors to the Site.

B. Contractor's Storage and Work Sheds:
1. Provide storage and work sheds sized, furnished, and equipped to accommodate personnel, materials, and equipment involved in the Work, including temporary utility services and facilities required for environmental controls sufficient for personnel, materials, and equipment.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Installation:
1. Install CONTRACTOR's temporary field offices, sheds, and related facilities in accordance with Laws and Regulations.
2. Install materials and equipment, including prefabricated structures, in accordance with manufacturer's instructions.

3.2 MAINTENANCE AND REMOVAL

A. Maintenance:
1. Clean and maintain field offices and sheds as required.
2. Provide consumables as required.

B. Removal:
1. Do not remove temporary field offices and sheds until after Substantial Completion of the entire Work, unless otherwise approved by ENGINEER.
2. Remove field offices and sheds and restore areas prior to final inspection.

+ + END OF SECTION + +

SECTION 01 55 13

ACCESS ROADS AND PARKING AREAS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide temporary construction roads, walks, parking areas, and appurtenances required during the Project for use by CONTRACTOR, other contractors employed on the Project, OWNER's, facility manager's, and emergency vehicles.
   2. Temporary roads and parking areas shall be designed and maintained by CONTRACTOR and shall be fully passable to vehicles in all weather conditions.

B. Use of Existing Access Roads:
   1. CONTRACTOR is allowed to use OWNER's existing roads starting on the Effective Date of the Contract and satisfying other Contract requirements relative to starting the Work.
   2. Prevent interference with traffic on existing roads and parking areas. Always keep access roads and entrances serving the Site clear and available to OWNER, facility manager, and their respective employees; emergency vehicles; and other contractors. Do not use access roads or Site entrances for parking or storage of materials or equipment.
   3. CONTRACTOR shall indemnify and hold harmless OWNER and ENGINEER from expenses and losses caused by CONTRACTOR's operations over existing roads, drives, and parking areas.
   4. Schedule deliveries to minimize use of driveways and Site entrances.

1.2 SITE ACCESS

A. Site Access:
   1. CONTRACTOR access to the Site shall be via the Cargil Park (Central School) Road.

1.3 CONTRACTOR PARKING

A. CONTRACTOR shall procure offsite parking for his employees. On-site parking shall be limited to the staging areas shown on the Drawings or as designated by the OWNER.

B. Parking in the Central School parking lots not included in the County easement and designated staging area is prohibited during 7 am to 4 pm when school is in session.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials for temporary roads and parking areas shall comply with the Contract Documents' requirements for permanent roads, drives, and parking areas.

B. Traffic controls shall comply with requirements of authorities having jurisdiction.

PART 3 – EXECUTION

3.1 TEMPORARY ROADS AND PARKING AREAS

A. Temporary Roads and Parking in Same Areas as Permanent Pavement:
   1. Provide temporary roads and parking areas adequate to support and withstand traffic and construction loads during the Project. Locate temporary roads and parking areas in same location as permanent roads and parking areas. Extend temporary roads and parking areas, within construction limits indicated, as required for construction operations.
   2. Coordinate elevations of temporary roads and parking areas with permanent roads and parking areas.
   3. Prepare subgrade, subbase, and base for temporary roads and parking areas in accordance with the Contract Documents requirements for permanent roads, drives, and parking areas.
   4. Where required by subgrade conditions and construction loads and traffic, provide geosynthetic separation fabric as required on compacted subgrade for subbase support and separation of subbase and subgrade materials.
   5. Delay installation of top (wearing) courses of permanent pavement until road or parking area will no longer be subject to heavy construction traffic. Repair damage to pavement's bituminous base courses before providing permanent top courses.

3.2 TRAFFIC CONTROLS

A. Traffic Controls:
   1. Provide temporary traffic controls at intersections of temporary roads with each other and with parking areas, including intersections with other temporary roads, intersections with public roads, and intersections with permanent access roads at the Site.
   2. Provide temporary warning signs on permanent roads and drives, and provide temporary "STOP" signs for traffic on temporary roads where required and at entrances to permanent pavement.
   3. Comply with requirements of authorities having jurisdiction. When such authority is the OWNER or facility manager, and no requirements are

indicated, comply with the standard specifications of the state department of transportation in the area of the Project

3.3 MAINTENANCE OF ROADS

A. General:
   1. Maintain temporary roads and parking to continuously provide at the Site access for construction vehicles and trucks, OWNER and facility manager vehicles, deliveries for OWNER and facility manager, emergency vehicles, and parking areas for OWNER's and facility manager's personnel.
   2. Public roads shall be passable at all times unless a road closure is allowed in writing by authority having jurisdiction.
   3. When granular material of temporary roads and parking without hard surfacing become intermixed with soil or when temporary roads otherwise create a nuisance, remove intermixed granular-and-soil material and replace with clean granular material as required.
   4. Provide snow and ice removal for temporary roads and parking areas.

B. Cleaning and Dust Control:
   1. Cleaning: Clean paved surfaces over which construction vehicles travel. Perform cleaning not less often than the frequency indicated in Section 01 74 05, Cleaning, or more frequently as directed by ENGINEER, by mechanical sweeping or other means acceptable to ENGINEER.
   2. Clean the following surfaces:
      a. Roads within limits of the Project.
      b. Permanent roads at the Site between the Site entrance and the work areas, and between the Site entrance and construction parking and staging areas.
      c. Public roads that require sweeping and cleaning due to construction operations.
   3. Dust Control:
      a. Control dust resulting from construction activities to prevent nuisances at the Site and in nearby areas.
      b. Comply with Section 01 41 27, Earthmoving and Dust Control, and Section 01 57 00, Temporary Controls.

C. Protection of Underground Facilities: Comply with the General Clauses, Section 01 71 33, Protection of the Work and Property, and other requirements of the Contract Documents.

3.4 REMOVALS AND RESTORATION

A. Removals:
   1. Remove temporary roads, drives, walks, and parking areas that are not intended for, or acceptable for, integration into permanent pavement. Return areas of temporary roads, drives, walks, and parking to pre-construction condition unless otherwise required by the Contract Documents.

2. Remove temporary gates, fencing, and traffic controls associated with temporary roads and parking areas.
3. Where areas of temporary roads and parking will be permanently landscaped, remove pavement, granular subbase, geosynthetic (where required by ENGINEER), soil, and other materials that do not comply with the Contract Documents regarding fill, subsoil, and landscaping.
4. Remove and properly dispose of materials contaminated with oil, bitumen, and other petrochemical compounds resulting from CONTRACTOR's operations, and other substances that might impair growth of plants and lawns.

B. Restoration:
1. Repair or replace paving, curbs, gutters, and sidewalks affected by temporary roads and parking, and restore to required conditions in accordance with authorities having jurisdiction.
2. Restore to pre-construction conditions existing roads, walks, and parking areas damaged by CONTRACTOR, subject to approval of the owner of affected roads, drives, walks, and parking areas.

+ + END OF SECTION + +

SECTION 01 55 26

MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall keep all roads, streets, and traffic ways open for passage of traffic and pedestrians during the Work, unless otherwise approved by owner of the street, traffic way, or right-of-way, as applicable.
   2. Construction traffic shall access the Site only via entrance(s) indicated in Section 01 55 13, Access Roads and Parking Areas.
   3. Unless otherwise shown or indicated in the Contract Documents, maintenance and protection of traffic shall be in accordance with Section 104-08 of the New York State Department of Transportation Standard Specifications.
   4. Comply with Article 8, "Traffic", of the General Clauses.

B. Coordination:
   1. Coordinate with owner of the highway or street right-of-way, as applicable, for maintenance and protection of traffic requirements.
   2. Give required advance notice to fire departments, police departments, and other emergency services as applicable of proposed construction operations.
   3. Give reasonable notice to owners or tenants of private property who may be affected by construction operations. Give such notice not less than seven days prior to when such property will or may be affected by construction operations.
   4. Coordinate with requirements of the following:
      a. Section 01 55 13, Access Roads and Parking Areas.
      b Section 01 71 33, Protection of the Work and Property, regarding temporary barriers.
      d. Section 31 20 00, Earthwork Moving, for temporary barriers at excavations.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment used for maintenance and protection of traffic shall comply with the reference specification indicated in Paragraph 1.1.A.3 of this Section.

PART 3 – EXECUTION

3.1 GENERAL PROVISIONS

A. When required to cross, obstruct, or temporarily close a street or traffic way, provide and maintain suitable bridges, detours, or other acceptable temporary expedient for the accommodation of traffic. Closings shall be for shortest duration practical, and passage shall be restored immediately after completion of filling and temporary paving or bridging.

B. Temporary Control Devices:
   1. Provide temporary signs, signals, barricades, flares, lights and other equipment, services, and personnel required to regulate and protect traffic and warn of hazards.
   2. Such Work shall comply with requirements of OWNER and authorities having jurisdiction at the Site.
   3. Remove temporary equipment and facilities when no longer required, and restore grounds to condition indicated in the Contract Documents; if not indicated, resort to pre-construction conditions.

C. Keep accessible for use permanent facilities such as hydrants, valves, fire alarm boxes, postal boxes, delivery service boxes, and other facilities that may require access during construction.

3.2 TRAFFIC SIGNALS AND SIGNS

A. Provide and operate temporary traffic controls and directional signals required to direct and maintain an orderly flow of traffic in areas under CONTRACTOR's control, and areas affected by construction operations.

B. Provide temporary traffic controls and directional signs, mounted on temporary barriers or standard posts, at the following locations:
   1. Each change of direction of a roadway and at each crossroad.
   2. Detours and areas of hazard.
   3. Parking areas.
   4. Traffic entrance to and exit from each construction area.

3.3 TRAFFIC CONTROL PERSONNEL

A. General:
   1. When construction operations encroach on traffic lanes, furnish qualified and suitably-equipped traffic control personnel as required for regulating traffic and in accordance with requirements of authorities having jurisdiction.
   2. Traffic control personnel shall use appropriate flags or mobile signs.
   3. Equip traffic control personnel with appropriate personal protection equipment and suitable attire.

4. Attire and conduct of traffic control personnel shall be appropriate and shall not create nuisances or distractions for traffic.

3.4 FLARES AND LIGHTS

A. During periods of low visibility provide temporary flares and lights for the following:
   1. To clearly delineate traffic lanes, to guide traffic, and to warn of hazardous areas.
   2. For use by traffic control personnel directing traffic.

B. Provide adequate illumination of critical traffic and parking areas.

3.5 PARKING CONTROL

A. Control CONTRACTOR-related vehicular parking at the Site to preclude interfering with: traffic and parking, access by emergency vehicles, OWNER's and facility manager's operations, and construction operations. Provide temporary parking facilities for the public, as required because of construction operations.

B. Control parking of construction and private vehicles at the Site as follows:
   1. Maintain free vehicular access to and through parking areas.
   2. Prohibit parking on or adjacent to access roads, and in non-designated areas.
   3. Construction vehicles shall possess current vehicle registration.
   4. Private vehicles shall park only in designated areas.

3.6 HAUL ROUTES

A. Consult with authorities having jurisdiction to establish thoroughfares that will be used as haul routes and Site access.

B. Confine construction traffic to designated haul routes.

C. Provide temporary traffic controls at critical areas of haul routes to expedite traffic flow, and to minimize interference with normal traffic.

3.7 REMOVAL

A. Maintain and protect traffic until Substantial Completion and at all times thereafter when CONTRACTOR is working at the Site. Provide maintenance and protection of traffic measures at the Site until no longer required due to the progress of the Work. When no longer required, completely remove maintenance and protection of traffic measures and restore the Site to condition required by the Contract Documents or, when not indicated in the Contract Documents, to pre-construction conditions.

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SECTION 01 57 05

TEMPORARY CONTROLS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide and maintain methods, materials, equipment, and temporary construction as required for controlling environmental conditions at the Site and adjacent areas during construction.
   2. Maintain controls until no longer required. Provide temporary controls at all times when CONTRACTOR is working at the Site.
   3. Temporary controls include, but are not limited to, the following:
      a. Erosion and sediment controls.
      b. Noise controls.
      c. Dust controls.
      d. Pest and rodent controls.
      e. Control of water, including storm water runoff.
      f. Pollution controls.

B. Related Sections:
   1. Section 01 35 43.13, Environmental Procedures for Hazardous Materials.
   2. Section 31 20 20, Earth Moving.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions and recommendations of the following:
   1. New York State Department of Environmental Conservation "NY Standards and Specification for Erosion and Sediment Control".

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Plan for construction staging and maintenance of the Site relative to erosion and sediment controls. Indicate on a site plan approximate areas of planned disturbance of soils and soil cove over time during the Project. For areas not indicated in the Contract Documents as being disturbed and that CONTRACTOR proposes to disturb, Shop Drawing shall include proposed erosion and sediment control measures for the additional area.
   2. Product Data:
      a. Silt fencing materials.

B. Informational Submittals: Submit the following:
   1. Procedural Submittals:
      a. Proposed dust control measures, when submittal is requested by ENGINEER.

PART 2 – PRODUCTS

2.1 MATERIALS FOR TEMPORARY EROSION AND SEDIMENT CONTROLS

A. General:
   1. Materials utilized for temporary erosion and sediment controls shall be in accordance with the applicable regulatory requirements indicated in Article 1.2 of this Section, unless otherwise shown or indicated in the Contract Documents.

B. Silt Fencing:
   1. Filter Cloth:
      a. Products and Manufacturers: Provide one of the following:
         1) Contech “Silt Fence”.
         2) Hanes Geo Components “Silt Fence”.
         3) Atlantic Construction Fabrics (ACF) Environmental “Silt Fence”.
         4) Or equal.
      b. Height: Two feet, minimum.
      c. Securely fasten filter cloth to wire mesh using ties spaced at maximum intervals of two feet on centers at top and mid-height of wire mesh.
   2. Wire Mesh: Support filter cloth with wire mesh complying with the following:
      a. Woven wire mesh, 14-gauge steel wire, maximum mesh size six-inch by six-inch.
      b. Height: To match filter cloth height.
      c. Fasten wire mesh to fence supports with wire ties or staples.
   3. Fence Support Posts:
      a. Length: Not less than three feet.
      a. Material: Metal or other acceptable material with "U", “T”, or "I" cross section, or hardwood measuring not less than 1.25-inch by 1.25-inch in cross-section.

C. Straw Bale Dike.
   1. Bales shall be firmly-packed, unrotted straw bound firmly with baling wire. Cross-sectional area on the small end of each bale shall be approximately 12 inches by 12 inches or larger.
   2. Posts shall comply with requirements for silt fencing support posts, or may be suitable reinforcing steel rods.

D. Mulch Materials and Soil Stabilization.
   1. Mulch shall be unrotted straw or salt hay.

2. Soil stabilization emulsions, when used, shall be an inert, eco-friendly chemical manufactured for the specific purpose of erosion control and soil stabilization, applied with mulch or stabilization fibers.
3. Wood-fiber or paper-fiber, when used, shall be 100 percent natural and biodegradable.
4. Erosion control mat or netting shall be biodegradable. Acceptable materials include jute, excelsior, straw or coconut fiber, and cotton.

E. Protection of Storm Water Drainage Inlets and Catch Basins:
   1. Inlet Filter Bag:
      a. Product and Manufacturer: Provide one of the following for each drainage inlet or catch basin to be protected:
         1) Atlantic Construction Fabrics (ACF) Environmental, "Silt Sack".
         2) Mutual Industries, Inc. "Silt Sack".
         3) Or equal.
      b. Inlet filter bag permeability shall be not less than 40 gallons per square foot of bag area exposed to the flow. Fabric shall be woven polypropylene with double stitching to prevent bursting.
      c. Inlet filter bags shall shall:
         1) Fit inside the drainage inlet or catch basin and shall be secured by the structure's grate or by other acceptable means.
         2) Have means of removing inlet filter bag and the silt and sediment collected therein without dumping filter bag's contents into the drainage inlet or catch basin.

F. Filter Bag on Dewatering Pump Discharge:
   1. Provide filter bag on discharge of each dewatering pump drawing from an excavation. Filter bag is not required on pumps associated with dewatering wells.
   2. Products and Manufacturers: Provide one of the following:
      a. UltraTech Dewatering Bag, by Interstate Products.
      b. Filter Bag, by US Fabrics.
      c. Dewatering (Filter) Bag, by Indian Valley Industries.
      d. DirtBag, by Atlantic Construction Fabrics (ACF) Environmental
      e. Or equal.
   3. Size filter bags for maximum flow of the pump. Filter bags shall be specifically fabricated for use as a dewatering pump filter bag.
   4. Provide sufficient spare filter bags for continuous dewatering operations.

PART 3 – EXECUTION

3.1 NOISE CONTROL

A. Noise Control – General:
   1. CONTRACTOR's vehicles and equipment shall minimize noise emissions to greatest degree practicable. When necessary, provide mufflers and silencers on

construction equipment, and provide temporary sound barriers onsite when necessary.

2. Noise levels shall comply with Laws and Regulations, including OSHA requirements and local ordinances.
3. Noise emissions shall not interfere with the work of OWNER, facility manager, or others.

3.2 DUST CONTROL

A. Dust Control – General:
   1. Control objectionable dust caused by CONTRACTOR's operation of vehicles and equipment, clearing, demolition, cleaning, and other actions. To minimize airborne dust, apply water or use other methods subject to acceptance of ENGINEER and approval of authorities having jurisdiction.
   2. CONTRACTOR shall prevent blowing and movement of dust from exposed soil surfaces and access roads to reduce onsite and off-Site damage, nuisances, and health hazards associated with dust emissions.

B. Dust Control Methods:
   1. Dust control may be achieved by irrigation in which the dust-prone area of the Site shall be sprinkled with water until the surface is moist.
   2. Apply dust controls as frequently as required without creating nuisances such as excessive mud and ponding of water at the Site. Do not use water for dust control when water will cause hazardous or objectionable conditions such as ice, mud, ponds, and pollution.
   3. Provide dust control that is non-polluting and does not contribute to tracking-out of dirt and dust onto pavement.

C. Removal of Dust and Dirt from Travelled Surfaces:
   1. Remove dust and dirt from roadways, drives, parking areas, and other travelled surfaces not less than the frequency indicated in Section 01 74 05, Cleaning.
   2. Perform dust and dirt removals from travelled surfaces by mechanical sweeping or other method acceptable to ENGINEER.

3.3 PEST AND RODENT CONTROL

A. Pest and Rodent Control – General:
   1. Provide pest and rodent controls as required to prevent infestation of the Site and storage areas.
   2. Employ methods and use materials that do not adversely affect conditions at the Site or on adjoining properties.
   3. In accordance with Laws and Regulations, promptly and properly dispose of pests and rodents trapped or otherwise controlled.

3.4 WATER CONTROL

A. Water Control – General:

1. Provide methods to control surface water and water from excavations and structures to prevent damage to the Work, the Site, and adjoining properties.
2. Control fill, grading, and ditching to direct water away from excavations, pits, tunnels and other construction areas and to direct drainage to proper runoff courses to prevent erosion, damage, or nuisance. Avoid directing to adjoining properties runoff from the Site and construction operations.

B. Equipment and Facilities for Water Control:
1. Provide, operate, and maintain equipment and facilities of adequate size to control surface water.

C. Discharge and Disposal:
1. Dispose of storm water and ground water in manner to prevent flooding, erosion, and other damage to any and all parts of the Site and adjoining areas, and that complies with Laws and Regulations.

3.5 POLLUTION CONTROL

A. Pollution Control – General:
1. Provide means, methods, and facilities required to prevent contamination of soil, water, and atmosphere caused by discharge of noxious substances from or caused by construction operations.
2. Equipment used during construction shall comply with Laws and Regulations.
3. Comply with Section 01 35 43.13, Environmental Procedures for Hazardous Materials.

B. Spills and Contamination:
1. Provide equipment and personnel to perform emergency measures required to contain spills and to remove contaminated soils and liquids.
2. Excavate contaminated material and properly dispose of off-Site, and replace with suitable compacted fill and topsoil.
3. Comply with OWNER's and facility manager's hazard control procedures as indicated in Section 01 35 23, Safety Requirements.

C. Protection of Surface Waters and Ground Water:
1. Provide and maintain special measures to prevent harmful substances from entering surface waters and ground water. Prevent disposal of wastes, effluents, chemicals, and other such substances in or adjacent to surface waters and open drainage routes, in sanitary sewers, or in storm sewers, and in ground water.

D. Atmospheric Pollutants:
1. Provide and maintain systems for controlling atmospheric pollutants related to the Work.
2. Prevent toxic concentrations of chemicals and vapors.
3. Prevent harmful dispersal of pollutants into atmosphere.

E. Solid Waste:
   1. Provide and maintain systems for controlling and managing solid waste related to the Work.
   2. Prevent solid waste from becoming airborne, and from discharging to surface waters and drainage routes.
   3. Properly handle and dispose of solid waste.
   4. Comply with requirements for cleaning and disposal of debris in the General Clauses, and Section 01 74 05, Cleaning.

3.6 EROSION AND SEDIMENT CONTROLS

A. Installation and Maintenance of Erosion and Sediment Controls – General:
   1. General:
      a. Provide temporary erosion and sediment controls as shown and indicated on the Drawings and as indicated elsewhere in the Contract Documents. Provide erosion and sediment controls as the Work progresses into previously-undisturbed areas.
      b. Installation of erosion and sediment controls shall be in accordance with the applicable regulatory requirements indicated in Article 1.2 of this Section, unless more-stringent methods are otherwise shown or indicated in the Contract Documents.
      c. Use necessary methods to successfully control erosion and sedimentation, including ecology-oriented construction practices, vegetative measures, and mechanical controls. Use best management practices (BMP) in accordance with Laws and Regulations, and regulatory requirements indicated in Article 1.2 of this Section, to control erosion and sedimentation during the Project.
      d. Plan and execute construction, disturbances of soils and soil cover, and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation. Provide temporary measures for controlling erosion and sedimentation, as indicated in the Contract Documents and as required for the Project.
      e. Where areas must be cleared for storage of materials or equipment, or for temporary facilities, provide measures for regulating drainage and controlling erosion and sedimentation, subject to the ENGINEER'S approval.
      f. Provide erosion and sediment controls, including stabilization of soils, at the end of each workday.
   2. Coordination:
      a. Coordinate erosion and sediment controls with this Section's requirements on water control.
      b. Coordinate temporary erosion and sediment controls with construction of permanent drainage facilities and other Work to the extent necessary for economical, effective, and continuous erosion and sediment controls.

3. Before commencing activities that will disturb soil or soil cover at the Site, provide all erosion and sediment control measures required by the Contract Documents for the areas where soil or soil cover will be disturbed.
4. In general, implement construction procedures associated with, or that may affect, erosion and sediment control to ensure minimum damage to the environment during construction. CONTRACTOR shall implement any and all additional measures required to comply with Laws and Regulations.
5. Vegetation Removal: Remove only those shrubs, grasses, and other vegetation that must be removed for construction. Protect remaining vegetation.
6. Access Roads and Parking Areas: When possible, access roads and temporary roads and parking shall be located and constructed to avoid adverse effects on the environment. Provide measures to regulate drainage, avoid erosion and sedimentation, and minimize damage to vegetation.
7. Earthwork and Temporary Controls:
    a. Perform excavation, fill, and related operations in accordance with Section 31 20 00, Earth Moving .
    b. Control erosion to minimize transport of silt from the Site into existing waterways and surface waters. Such measures shall include, but are not limited to, using berms, silt fencing, baled straw silt barriers, gravel or crushed stone, mulching and soil stabilization, slope drains, and other methods. Apply such temporary measures to erodible materials exposed by activities associated with the construction of the Project.
    c. Hold to a minimum the areas of bare soil exposed at one time.
    d. Construct fills and waste areas by selectively placing fill and waste materials to eliminate surface silts and clays that will erode.
    e. In performing earthwork, eliminate depressions that could serve as mosquito breeding pools.
    f. CONTRACTOR shall provide special care in areas with steep slopes, where disturbance of vegetation shall be minimized to maintain soil stability.
8. Inspection and Maintenance:
    a. Periodically inspect areas of earthwork and areas where soil or soil cover are disturbed to detect evidence of the start of erosion and sedimentation; promptly implement corrective measures as required to control erosion and sedimentation. Continue inspections and corrective measures until soils are permanently stabilized and permanent vegetation has been established
    b. Inspect not less often than the frequency as required by State Laws.
    c. Repair or replace damaged erosion and sediment controls within 24 hours of CONTRACTOR becoming aware of such damage.
    d. Periodically remove silt and sediment that has accumulated in or behind sediment and erosion controls. Properly dispose of silt and sediment.
9. Duration of Erosion and Sediment Controls:
    a. Maintain erosion and sediment controls in effective working condition until the associated drainage area has been permanently stabilized.

b. Maintain erosion and sediment controls until the Site is restored and site improvements including landscaping, if any, are complete with underlying soils permanently stabilized.

10. Work Stoppage:
    a. If the Work is temporarily stopped or suspended for any reason, CONTRACTOR shall provide additional temporary controls necessary to prevent environmental damage to the Site and adjacent areas while the Work is stopped or suspended.
11. Failure to Provide Adequate Controls:
    a. In the event CONTRACTOR repeatedly fails to satisfactorily control erosion and sedimentation, OWNER reserves the right to employ outside assistance or to use OWNER's own forces for erosion and sediment control.
    b. Cost of such work by OWNER, plus engineering and inspection costs, will be deducted from amounts due CONTRACTOR, as set-offs in accordance with the Contract Documents.

C. Silt Fencing:
1. Install and maintain silt fencing in a vertical plane, at the location(s) shown or indicated in the Contract Documents and where required.
2. Locations of Silt Fencing:
    a. Where possible, install silt fencing along contour lines so that each given run of silt fencing is at the same elevation.
    b. On slopes, install silt fencing at intervals that do not exceed the maximum intervals indicated in the following table:

Slope (percent)	Maximum Length of Slope Above Each Silt Fence (feet)
2 and less	150
2.1 to 5	100
5.1 to 10	50
10.1 to 20	25
20.1 to 25	20
25.1 to 40	15
40.1 to 50	10

    c. Provide silt fencing around perimeter of each stockpile of topsoil, general fill material, and excavated material. Install silt fencing before expected precipitation and maintain until stockpile is removed.
    d. Do not install silt fencing at the following types of locations:
        1) Area of concentrated storm water flows such as ditches, swales, or channels.
        2) Where rock or rocky soils prevent full and uniform anchoring of silt fencing.
        3) Across upstream or discharge ends of storm water piping or culverts.
3. Installation:

a. Securely fasten wire mesh to posts, and securely fasten filter cloth to wire mesh.
b. When two sections of filter cloth abut each other, fold over edges and overlap by not less than six inches and securely fasten to wire mesh.
c. Embed posts in the ground to the depth necessary for proper controls; embed posts to not less than 16 inches below ground.
d. Filter cloth and wire mesh shall extend not less than eight inches below ground and not less than 16 inches above ground.
e. Remove sediment accumulated at silt fencing as required. Repair and reinstall silt fencing as required.

4. Maintenance:
a. Do not allow formation of concentrated storm water flows on slopes above silt fencing unless so shown or indicated in the Contract Documents. If unauthorized concentrated storm water flows occur, stabilize the slope via earthmoving and other stabilization measures as required to prevent flow of concentrated storm water flows toward silt fencing.

D. Straw Bale Dike.
1. Install straw bale dikes where shown or indicated, including in swales, along contours, and along toe of slopes.
2. Install straw bales in shallow excavation as wide as the bale and approximately four to six inches below surrounding grade.
3. Ends of straw bales shall tightly abut ends of adjacent straw bales.
4. Securely install straw bales using two support posts per straw bale, driven into the ground not less than 1.5 to two feet below bottom of straw bale. Top of post shall be flush with top of straw bale. Angle first post for each straw bale toward the previously-installed straw bale.
5. Frequently inspect straw bales and repair or replace as required. Remove accumulated silt and debris from behind straw bales.

E. Mulching and Soil Stabilization:
1. Use mulching to temporarily stabilize exposed soil and fill material.
a. Immediately following final grading, provide mulch and stabilize with mats or netting, or sprayed soil stabilization emulsion with fiber additive.
b. Application of mulching for soil stabilization shall be as follows.
1) Unrotted Straw or Salt Hay: 1.5 to two tons per acre.
2) Soil stabilization emulsions, when used, shall be applied in accordance with manufacturer's instructions, and shall be applied with mulch or stabilization fibers.
3) Wood-fiber or Paper-fiber Application: 1,500 lbs. per acre, installed by hydroseeding.
c. Where mats or netting are used:
1) Cover entire area to be stabilized with mats or netting.
2) Provide anchoring trenches at the top and bottom of slopes to receive mats or netting. Bury at least the top and bottom ends of mat or netting, four inches or more wide, at top and bottom of slope. Tamp

trench full of soil. Four inches from trench, secure mat or netting with appropriate staples spaced at intervals of 10 inches.

3) Overlap adjacent strips of mat or netting by not less than four inches.

F. Protection of Storm Water Drainage Inlets and Catch Basins:
   1. Protect each drainage inlet and catch basin that has the potential to receive storm water runoff from exposed soils, and does not discharge into a storm water settlement basin.
   2. Install inlet filter bags inside of drainage inlet or catch basin in accordance with manufacturer's instructions. Secure inlet filter bag with the structure's grate or by other acceptable means.
   3. Inlet filter bags shall not pose any obstruction above the pre-construction elevation of the drainage inlet or catch basin grate requiring barricades or flashers.
   4. When removing silt and sediment from inlet filter bag, do not dump filter bag's contents into the drainage inlet or catch basin.
   5. Remove silt and sediment from inlet filter bag, or replace inlet filter bag, when inlet filter bag is not more than half full.

G. Filter Bag on Dewatering Pump Discharge:
   1. Provide dewatering of excavations in compliance with Division 31 Sections on earthmoving, excavation, and fill.
   2. Locate filter bags and temporary pump discharge lines to avoid interfering with the public, use of private property, and OWNER's and facility manager's operations. Relocate filter bags and appurtenances when required.
   3. Filter bag discharge shall be directed to appropriate storm water drainage route. Do not discharge into roadways, driveways, access roads, parking areas, or overland. When temporary settlement basin is used, locate filter bags to discharge to temporary settlement basin when practicable.
   4. Provide filter bag on discharge of each dewatering pump drawing from an excavation.
   5. Securely attach filter bag to pump discharge pipe or hose.
   6. Maintain, clean out, and replace filter bags as required.

3.7 REMOVAL OF TEMPORARY CONTROLS

A. Removals – General:
   1. Upon completion of the Work, remove temporary controls and restore Site to specified condition; if condition is not specified, restore Site to pre-construction condition.
   2. After soils are permanently stabilized, remove from the Site temporary erosion and sediment controls.

+ + END OF SECTION + +

SECTION 01 57 33

SECURITY

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for security at the Site, including accessing the Site, securing the Work, temporary fencing, and other requirements.
   2. CONTRACTOR shall safely guard all the Work, the Project, materials, equipment, and property from loss, theft, damage, and vandalism until Substantial Completion, unless otherwise agreed upon by the parties.
   3. CONTRACTOR's duty includes safely guarding OWNER's property in vicinity of the Work and Project, and other private property in the vicinity of the Project from injury and loss in connection with performance of the Project.
   4. Costs for security required under this Section shall be paid by CONTRACTOR.
   5. Make no claim against OWNER for damage resulting from trespass.
   6. Remedy damage to property of OWNER and others arising from failure to furnish adequate security.
   7. Provide temporary fencing in accordance with the Contract Documents.
   8. CONTRACTOR's security measures shall be at least equal to those usually provided by OWNER or facility manager to protect existing facilities during normal operation.

1.2 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Temporary Fencing: Submit site plan drawings showing proposed locations and extent of temporary site security fencing and each breach therein.
   2. Product Data:
      a. Temporary Fencing: Manufacturer's literature, specifications, and installation instructions for temporary site security fencing proposed.

1.3 CONTRACTOR'S SITE ACCESS AND SECURITY PROCEDURES

A. Comply with Section 01 55 13, Access Roads and Parking Areas.

B. Comply with OWNER's security procedures and access restrictions at the Site throughout the Project. Comply with the following:
   1. Personnel Identification:

a. All CONTRACTOR personnel, including Subcontractors, Suppliers, and others associated with the Project shall wear, at a visible location, at all times at the Site a durable, waterproof badge bearing CONTRACTOR's name, employer (if other than CONTRACTOR), employee's name and, as applicable, employee number.

2. General Provisions Regarding Personnel Identification:
   a. Prerequisites to Issuance of Personnel Identification Badges:
      1) Do not issue personnel identification badge until the person receiving the badge is documented by CONTRACTOR as:
         a) Being eligible to perform work in the jurisdiction where the Project is located.
         b) Has received all required safety instructions, training, and equipment.
         c) Is known to CONTRACTOR as being qualified to perform the Work to which the person will be assigned.
   b. Listing of Personnel to Whom Badges are Issued:
      1) Maintain and continuously update a listing or log of all personnel to whom personnel identification badges have been issued.
      2) Listing or log shall indicate each person's full name, home address, personal telephone number, employer name, and employer address and telephone number.
      3) Submit copy of listing or to OWNER in accordance with Article 1.2 of this Section.
3. Vehicle Identification:
   a. While on-Site, all CONTRACTOR vehicles, including employee vehicles, shall display vehicle identification tag in clearly visible location on dashboard.
   b. Vehicle tag shall be issued by CONTRACTOR.
   c. Vehicle tag shall include the following information: Site name, CONTRACTOR name, contract designation, vehicle license plate number and state of registration, name and employer of vehicle owner, and vehicle owner contact telephone number.
4. Parking:
   a. Do not park outside of designated CONTRACTOR parking area, which is shown on the Drawings. Prepare and maintain parking area as required.
   b. Personal vehicles are not allowed outside the contractor parking area.

PART 2 – PRODUCTS

2.1 TEMPORARY FENCING

A. Erect and maintain temporary fencing at locations shown on the Drawings, and at locations where permanent security fencing or barriers are breached or temporarily removed for the Work.
   1. Requirements:

a. Fence shall meet the requirements of Section 32 31 00 – Fences and as shown on the Contract Drawings.
b. Use of easily movable temporary fence panels and sandbags to hold down temporary fencing is not allowed.
c. Provide high density polyethylene (HDPE) privacy strips in fencing on all fence runs.

PART 3 – EXECUTION

3.1 TEMPORARY FENCING

A. Installation:
   1. Provide temporary fencing for site security so that integrity of site security is maintained throughout the Project.
   2. Install temporary fencing used for site security in accordance with the Contract Documents and fence manufacturer's instructions.

B. Maintenance:
   1. Maintain temporary fencing throughout the Project.
   2. Repair damage to temporary fencing and replace fencing when required to preserve Site security.

C. Removal:
   1. Remove temporary fencing when permanent site security fencing is in place and fully functional, or when otherwise directed or ENGINEER.

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SECTION 01 61 00

COMMON PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes:
      a. Common requirements for materials and equipment.
      b. Compatibility of materials and equipment.

1.2 REQUIREMENTS FOR MATERIALS AND EQUIPMENT

A. Unless otherwise indicated in the Contract Documents, furnish materials and equipment that:
   1. have not been previously been incorporated into another project or facility; and
   2. have not changed ownership after initial shipment from the manufacturer's factory or facility; and
   3. if stored since their manufacture or fabrication, have, while in storage, been properly maintained and serviced in accordance with the manufacturer's recommendations for long-term storage; submit documentation as required by ENGINEER that such maintenance and service has been performed; and
   4. that the item(s) have not been subject to degradation or deterioration since manufacture; and
   5. are the current model(s) or type(s) furnished by the Supplier.

B. To the extent possible, furnish from a single source those materials and equipment that are of the same generic kind.

C. Furnish materials and equipment complete with accessories, trim, finish, fasteners, and other items shown, indicated, or required for a complete installation for the indicated use and performance.

D. Standard Items: When available, and unless custom or nonstandard options are specified or indicated, furnish standard materials and equipment of types that have been produced and used successfully in similar situations on other projects.

E. Visual Matching: Where required in the Contract Documents, furnish materials and equipment that match (as determined by ENGINEER) referenced existing construction, and mock-ups and Sample(s) approved by ENGINEER.

F. Where the Contract Documents include the phrase "as selected" for color of materials or equipment, finish pattern, option, or similar phrase, provide materials and equipment selected by ENGINEER as follows:

1. Standard Range: Where the Contract Documents include the phrase “standard range of colors, patterns, textures” or similar wording, provide color, pattern, density, or texture selected by ENGINEER from manufacturer’s product line that does not include premium items.
2. Full Range: Where the Contract Documents include the phrase “full range of colors, patterns, textures” or similar wording, ENGINEER will select color, pattern, density, or texture from manufacturer’s entire product line, including standard and premium items.

1.3 COMPATIBILITY

A. Similar materials and equipment by the same Supplier shall be compatible with each other, unless otherwise indicated in the Contract Documents or approved by ENGINEER.

B. Provide materials and equipment compatible with items previously selected or installed on the Project.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 62 00

PRODUCT OPTIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes:
      a. CONTRACTOR's options for selecting materials and equipment.
      b. Requirements for consideration of "or-equal" materials and equipment.

1.2 PRODUCT OPTIONS

A. For materials and equipment specified only by reference standard or description, without reference to Supplier, furnish materials and equipment complying with such standard, by a Supplier or from a source that complies with the Contract Documents.

B. For materials and equipment specified by naming one or more items or Suppliers, furnish the named materials and equipment that comply with the Contract Documents, unless an "or-equal" or substitute item is approved by ENGINEER.

C. For materials and equipment specified by naming one or more items or Suppliers and the term, "or-equal", when CONTRACTOR proposes a material or equipment item or Supplier as an "or-equal", submit to ENGINEER a request for approval of an "or-equal" item or Supplier.

1.3 "OR-EQUAL" ITEMS

A. Procedure:
   1. For proposed materials and equipment not named in the Contract Documents and considered as an "or-equal" in accordance with the General Clauses, CONTRACTOR shall request in writing ENGINEER's approval of the "or-equal".
   2. Request for approval of an "or-equal" item shall accompany the Shop Drawing or product data submittal for the proposed item

B. Requests for approval of "or-equals" shall include:
   1. CONTRACTOR's written request that the proposed item be considered as an "or-equal" in accordance with the General Clauses, accompanied by CONTRACTOR's certifications required in the General Clauses.
   2. Documentation adequate to demonstrate to ENGINEER that proposed item does not require extensive revisions to the Contract Documents, that proposed item is consistent with the Contract Documents, and that proposed item will

produce results and performance required in the Contract Documents, and that proposed item is compatible with other portions of the Work.

3. Detailed comparison of significant qualities of proposed item with the materials and equipment and manufacturers named in the Contract Documents. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements shown or indicated.
4. Evidence that proposed item's manufacturer will furnish warranty equal to or better than that specified, if any.
5. List of similar installations for completed projects with project names and addresses, and names and address of design professionals and owners, when requested.
6. Samples, when requested by ENGINEER.
7. Other information requested by ENGINEER.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 65 00

PRODUCT DELIVERY REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for preparing for shipping, delivering, and handling materials and equipment to be incorporated into the Work.
   2. CONTRACTOR shall make all arrangements for transporting, delivering, and handling of materials and equipment required for prosecution and completion of the Work.
   3. When required, move stored materials and equipment without changes to the Contract Price or Contract Times.

1.2 SUBMITTALS

A. Refer to individual Specifications Sections for submittal requirements relative to delivering and handling materials and equipment.

1.3 PREPARING FOR SHIPMENT

A. When practical, factory-assemble materials and equipment. Mark or tag separate parts and assemblies to facilitate field-assembly. Cover machined and unpainted parts that may be damaged by the elements or climate with strippable, protective coating.

B. Package materials and equipment to facilitate handling, and protect materials and equipment from damage during shipping, handling, and storage. Mark or tag outside of each package and crate to indicate the associated purchase order number, bill of lading number, contents by name, OWNER's contract designation, CONTRACTOR name, equipment number, and approximate weight. Include complete packing lists and bills of materials with each shipment.

C. Protect materials and equipment from exposure to the elements and damage by climate, and keep thoroughly dry and dust-free at all times. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Lubricate bearings and other items requiring lubrication in accordance with manufacturer's instructions.

D. Advance Notification of Shipments:
   1. Keep ENGINEER informed of delivery of all materials and equipment to be incorporated in the Work.

2. Upon receipt of Supplier's advance notice of shipment, not less than seven days prior to delivery of materials and equipment, provide ENGINEER written notification of anticipated date and place of arrival of the following:
    a. Dry-pit submersible pumps.
    b. Pumping station control panel.
    c. Generator.

E. Do not ship materials and equipment until:
1. Related Shop Drawings, Samples, and other submittals required by the Contract Documents have been approved or accepted (as applicable) by ENGINEER, including, but not necessarily limited to, all Action Submittals associated with the materials and equipment being delivered.
2. Manufacturer's instructions for handling, storing, and installing the associated materials and equipment have been submitted to and accepted by ENGINEER in accordance with the Specifications.
3. Results of source quality control testing (factory testing), when required by the Contract Documents for the associated materials or equipment, have been submitted to and accepted by ENGINEER.
4. Facilities required for handling materials and equipment in accordance with the Contract Documents and manufacturer's instructions are in place and available.
5. Required storage facilities have been provided.

1.4 DELIVERY

A. Scheduling and Timing of Deliveries:
1. Arrange deliveries of materials and equipment in accordance with the Progress Schedule accepted by ENGINEER and in ample time to facilitate inspection and observation prior to installation.
2. Schedule deliveries to minimize space required for and duration of storage of materials and equipment at the Site or other delivery location, as applicable.
3. Coordinate deliveries to avoid conflicting with the Work and conditions at Site, and to accommodate the following:
    a. Work of other contractors and OWNER.
    b. Storage space limitations.
    c. Availability of equipment and personnel for handling materials and equipment.
    d. OWNER's use of premises.
4. Deliver materials and equipment to the Site during regular working hours.
5. Deliver materials and equipment to avoid delaying the Work and the Project, including work of other contractors, as applicable. Deliver anchor system materials, including anchor bolts to be embedded in concrete or masonry, in ample time to avoid delaying the Work.

B. Deliveries:
   1. Shipments shall be delivered with CONTRACTOR's name, Subcontractor's name (if applicable), Site name, Project name, and contract designation (example: "Weaver Street Pumping Station, Pumping Station Upgrade, Contract XX-XXX") clearly marked.
   2. Site may be listed as the "ship to" or "delivery" address; but OWNER shall not be listed as recipient of shipment unless otherwise directed in writing by ENGINEER.
   3. Provide CONTRACTOR's telephone number to shipper; do not provide OWNER's telephone number.
   4. Arrange for deliveries while CONTRACTOR's personnel are at the Site. CONTRACTOR shall receive and coordinate shipments upon delivery. Shipments delivered to the Site when CONTRACTOR is not present will be refused by OWNER, and CONTRACTOR shall be responsible for the associated delays and additional costs, if incurred.
   5. Comply with Section 01 35 43.13, Environmental Procedures for Hazardous Materials.

C. Containers and Marking:
   1. Have materials and equipment delivered in manufacturer's original, unopened, labeled containers.
   2. Clearly mark partial deliveries of component parts of materials and equipment to identify materials and equipment, to allow easy accumulation of parts, and to facilitate assembly.

D. Inspection of Deliveries:
   1. Immediately upon delivery, inspect shipment to verify that:
      a. Materials and equipment comply with the Contract Documents and approved or accepted (as applicable) submittals.
      b. Quantities are correct.
      c. Materials and equipment are undamaged and of the required quality.
      d. Containers and packages are intact and labels are legible.
      e. Materials and equipment are properly protected.
   2. Promptly remove damaged materials and equipment from the Site and expedite delivery of new, undamaged materials and equipment, and remedy incomplete or lost materials and equipment. Furnish materials and equipment in accordance with the Contract Documents, to avoid delaying progress of the Work.
   3. Advise ENGINEER in writing when damaged, incomplete, or defective materials and equipment are delivered, and advise ENGINEER of the associated impact on the Progress Schedule.

1.5 HANDLING OF MATERIALS AND EQUIPMENT

A. Provide equipment and personnel necessary to handle materials and equipment, including those furnished by OWNER, by methods that prevent soiling or damaging materials and equipment and packaging.

B. Provide additional protection during handling as necessary to prevent scraping, marring, and otherwise damaging materials and equipment and surrounding surfaces.

C. Handle materials and equipment by methods that prevent bending and overstressing.

D. Lift heavy components only at designated lifting points.

E. Handle materials and equipment in safe manner and as recommended by the manufacturer to prevent damage. Do not drop, roll, or skid materials and equipment off delivery vehicles or at other times during handling. Hand-carry or use suitable handling equipment.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 66 00

PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for storing and protecting materials and equipment.
   2. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals to store and handle materials and equipment to be incorporated into the Work, and other materials and equipment at the Site.

1.2 STORAGE

A. Store and protect materials and equipment in accordance with manufacturer's recommendations and the Contract Documents.

B. General:
   1. CONTRACTOR shall make all arrangements and provisions necessary for, and pay all costs for, storing materials and equipment.
   2. Excavated materials, construction equipment, and materials and equipment to be incorporated into the Work shall be placed to avoid injuring the Work and existing facilities and property, and so that free access is maintained at all times to all parts of the Work and to public utility installations in vicinity of the Work.
   3. Store materials and equipment neatly and compactly in locations that cause minimum inconvenience to OWNER, facility manager, other contractors, public travel, and owners, tenants, and occupants of adjoining property.
   4. Arrange storage in manner to allow easy access for inspection by ENGINEER and Resident Project Representative (RPR).

C. Storage Location:
   1. Areas available at the Site for storing materials and equipment are shown or indicated in the Contract Documents, or as acceptable to ENGINEER.
   2. Restrictions:
      a Do not store materials or equipment in structures being constructed unless approved by ENGINEER in writing.
      b. Do not use lawns or other private property for storage without written permission of the owner or other person in possession or control of such premises.

D. Protection of Stored Materials:
   1. Store materials and equipment to become OWNER's property to ensure

preservation of quality and fitness of the Work, including proper protection against damage by freezing, moisture, and with outdoor ambient air high temperatures as high as 100 degrees F; temperature and humidity inside crates, containers, storage sheds, and packaging may be significantly higher than the outdoor ambient air temperature.

2. Store in indoor, climate-controlled storage areas all materials and equipment subject to damage by moisture, humidity, heat, cold, and other elements, unless otherwise acceptable to OWNER.
3. When placing orders to Suppliers for equipment and controls containing computer chips, electronics, and solid-state devices, CONTRACTOR shall obtain, coordinate, and comply with specific temperature and humidity limitations on materials and equipment, because temperature inside cabinets and components stored in warm temperatures can approach 200 degrees F.
4. CONTRACTOR shall be fully responsible for loss or damage (including theft) to stored materials and equipment.
5. Do not open manufacturer's containers until time of installation, unless recommended by the manufacturer or otherwise specified in the Contract Documents.
6. Comply with requirements of Article 1.3 of this Section.

1.3 PROTECTION – GENERAL

A. Equipment to be incorporated into the Work shall be boxed, crated, or otherwise completely enclosed and protected during shipping, handling, and storage, in accordance with Section 01 65 00, Product Delivery Requirements.

B. Store all materials and equipment off the ground (or floor) on raised supports such as skids or pallets.

C. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Painted equipment surfaces that are damaged or marred shall be repainted in their entirety in accordance with equipment manufacturer and paint manufacturer requirements, to the satisfaction of ENGINEER.

D. Protect electrical equipment, controls, and instrumentation against moisture, water damage, humidity, heat, cold, and dust. Space heaters provided in equipment shall be connected and operating at all times until equipment is placed in operation and permanently connected.

1.4 UNCOVERED STORAGE

A. The following types of materials may be stored outdoors without cover on supports so there is no contact with the ground:
   1. Reinforcing steel.
   2. Precast concrete materials.
   3. Structural steel.
   4. Metal stairs.

5. Handrails and railings.
6 Grating.
7. Checker plate.
8. Metal access hatches.
9. Castings.
10. Fiberglass items.
11. Rigid electrical conduit, except PVC-coated conduit.
12. Piping, except PVC or chlorinated PVC (CPVC) pipe.

1.5 COVERED STORAGE

A. The following materials and equipment may be stored outdoors on supports and completely covered with covering impervious to water:
   1. Grout and mortar materials.
   2. Masonry units.
   3. Rough lumber.
   4. Soil materials and granular materials such as aggregate.
   5. PVC and CPVC pipe.
   6. PVC-coated electrical conduit.

B. Tie down covers with rope, and install covering properly sloped to prevent accumulation of water.

C. Store loose granular materials, with covering impervious to water, in well-drained area or on solid surfaces to prevent mixing with foreign matter.

1.6 FULLY PROTECTED STORAGE

A. Store all material and equipment not indicated in Articles 1.4 and 1.5 of this Section on supports in buildings or trailers that have concrete or wooden flooring, roof, and fully-closed walls on all sides. Covering with visquine plastic sheeting or similar material in space without floor, roof, and walls is unacceptable. Comply with the following:
   1. Provide heated storage for materials and equipment that could be damaged by low temperatures or freezing.
   2. Provide air-conditioned storage for materials and equipment that could be damaged by high temperatures or humidity.
   3. Protect mechanical and electrical equipment from being contaminated by dust, dirt, and moisture.
   4. Maintain humidity at levels recommended by manufacturers for electrical and electronic equipment.

B. Storage of Major Equipment:
   1. Storage of the equipment indicated below shall comply with this Paragraph 1.6.A of this Section:
      a. Wastewater pumps.
      b. Valves and sluice gates.

c. Generator.
d. Control panels.
e. Instruments.
d. Electrical equipment.

2. Storage shall be in third-party owned, bonded, insured, climate-controlled warehouse in Westchester County.
3. Storage shall be within 30 miles of project sites.

1.7 HAZARDOUS MATERIALS AND EQUIPMENT

A. Prevent contamination of personnel, storage areas, and the Site. Comply with Laws and Regulations, manufacturer's instructions, Section 01 35 43.13, Environmental Procedures for Hazardous Materials, and other provisions of the Contract Documents.

1.8 MAINTENANCE OF STORAGE

A. On a scheduled basis, periodically inspect stored materials and equipment to ensure that:
   1. Condition and status of storage facilities is adequate to provide required storage conditions.
   2. Required environmental conditions are maintained on continuing basis.
   3. Materials and equipment exposed to elements are not adversely affected.

B. Mechanical and Electrical Equipment in Long-Term Storage:
   1. Mechanical and electrical equipment requiring long-term storage shall have complete manufacturer's instructions for servicing each item, with notice of enclosed instructions shown on exterior of container or packaging.
   2. Comply with manufacturer's instructions on scheduled basis.
   3. Space heaters that are part of electrical equipment shall be connected and operated continuously until equipment is placed in service and permanently connected.
   4. Affidavits:
      1. Submit to ENGINEER affidavit for each time that maintenance and inspection was performed on materials and equipment in long-term storage. Affidavit shall be signed by CONTRACTOR and entity performing the inspection and maintenance on the stored items.
      2. Affidavit shall indicate the date of the inspection, personnel and employer of each involved, specific stored items inspected, equipment condition, problems observed, problems corrected, maintenance tasks performed, conditions of storage environment, and other pertinent information.
      3. Affidavit shall include signed statement by the manufacturer of the item(s) indicating whether the storage conditions and tasks performed are suitable for continued compliance with manufacturer's warranties.

1.9 MICROPROCESSORS, PANELS, AND INSTRUMENTATION STORAGE

A. Store control panels, microprocessor-based equipment, electronics, and other devices subject to damage or decreased useful life because of temperatures below 40 degrees F or above 100 degrees F, relative humidity above 90 percent, or exposure to rain or exposure to blowing dust in climate-controlled storage space.

B. General:
   1. Storage shall be in third-party owned, bonded, insured, climate-controlled warehouse in Westchester County. Storage shall be within 30 miles of project sites.
   2. OWNER and ENGINEER have the right to observe or inspect materials and equipment during normal working hours.
   3. Place inside each control panel or device a desiccant, volatile corrosion inhibitor blocks (VCI), moisture indicator, and maximum-minimum indicating thermometer.
   4. Check panels and equipment not less than once per month. Replace desiccant, VCI, and moisture indicator as often as required, or every six months, whichever occurs first.
   5. Certified record of daily maximum and minimum temperature and humidity in storage facility shall be available for inspection by OWNER and ENGINEER. Certified record of monthly inspection, noting maximum and minimum temperature for month, condition of desiccant, VCI, and moisture indicator, shall be made available to OWNER and ENGINEER upon request.

C. Costs for storing climate-sensitive materials and equipment shall be paid by CONTRACTOR. Replace panels and devices damaged during storage, or for which storage temperatures or humidity range has been exceeded, at no additional cost to OWNER. Delays resulting from such replacement are causes within CONTRACTOR's control.

D. Do not ship control panels and equipment to the Site until conditions at the Site are suitable for installation, including slabs and floors, walls, roofs, and environmental controls. Failure to have the Site ready for installation shall not relieve CONTRACTOR from complying with the Contract Documents.

1.10 RECORDS

A. Keep up-to-date account of materials and equipment in storage to facilitate preparation of Applications for Payment, if the Contract Documents provide for payment for materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 71 23

FIELD ENGINEERING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes field engineering, surveying, and layouts by CONTRACTOR, and associated requirements. This Section supplements the General Conditions' provisions on reference points and other matters.
   2. CONTRACTOR shall provide field engineering services, surveying and layout services, and professional services of the types indicated for the Project, including:
      a. Furnishing civil, structural, and other professional engineering services specified or required to execute CONTRACTOR's construction methods.
      b. Developing and making all detail surveys and measurements required for construction; including slope stakes, batter boards, and all other working lines, elevations, and cut sheets.
      c. Providing materials required for benchmarks, control points, batter boards, grade stakes, structure and pipeline elevation stakes, and other items.
      d. Keeping a transit, theodolite, or total station (i.e., theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the Site at all times, and having a skilled instrument person available when necessary for laying out the Work.
      e. Being solely responsible for all locations, dimensions and levels. No data other than Change Order, Work Change Directive, or Field Order shall justify departure from dimensions and levels required by the Contract Documents.
      f. Rectifying all Work improperly installed because of not maintaining, not protecting, or removing without authorization established reference points, stakes, marks, and monuments.
      g. Providing such facilities and assistance necessary for ENGINEER and Resident Project Representative (if any) or Owner's Site Representative (if any) to check lines and grade points placed by CONTRACTOR. Do not perform excavation or embankment work until all cross-sectioning necessary for determining payment quantities for Unit Price Work have been completed and accepted by ENGINEER.

B. Coordination:
   1. Review requirements of this and other Sections and coordinate installation of items to be installed with or before field engineering, surveying, and layout Work.

1.2 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Certificates:
      a. When requested by ENGINEER, submit certificate signed by professional engineer or professional surveyor, as applicable, certifying that elevations and locations of the Work comply with the Contract Documents. Explain each deviation, if any.
   2. Field Engineering:
      a. Submit daily reports as indicated in this Section.
      b. When requested by ENGINEER, submit documentation verifying accuracy of field engineering.
   3. Surveying:
      a. Complete plan for performing survey work, submitted not less than 10 days prior to beginning survey Work.
      b. Example of proposed survey field books to be maintained by CONTRACTOR's surveyor. Example shall have sufficient information and detail, including example calculations and notes, to demonstrate that field books will be organized and maintained in a professional manner in accordance with the Contract Documents.
      c. Submit original field books within two days after completing survey Work.
      d. Submit certified survey in accordance with this Section.
   4. Qualifications Statements:
      a. Field Engineer: Name, employer, and professional address. When requested by ENGINEER, submit qualifications, including resume'.
      b. Surveyor: Name, employer, and professional address of firm, and resumes of each professional land surveyor and crew chief that will be engaged in survey Work. Submit not less than 10 days prior to beginning survey Work. During the Project, submit resume for each new registered, licensed land surveyor and crew chief employed by or retained by CONTRACTOR not less than 10 days prior to starting on the survey Work.

1.3 CONTRACTOR'S ENGINEERS

A. Professionals Retained by Contractor (whether or not stationed at the Site):
   1. Delegated Professional Design Services:
      a. Where the Contract Documents require CONTRACTOR to furnish professional engineering or architecture services as delegated professional design, the provisions of the Contract Documents' requirements applicable to the specific delegated professional design, shall apply.
   2. Professional Services that are Not Delegated Professional Design of the Completed Work:

a. Where the Contract Documents require that CONTRACTOR retain a design professional for to carry out CONTRACTOR's responsibilities for construction means, methods, techniques, sequences and procedures (including temporary construction that will not remain as part of the completed Work), such services shall be performed by a registered professional of the discipline required for specific service on the Project, with valid license in the same jurisdiction as the Site.
b. OWNER and ENGINEER shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed by such design professionals.

1.4 CONTRACTOR'S SURVEYOR

A. Qualifications:
1. Employ or retain the services, as needed, at the Site a surveyor with experience and capability of performing surveying and layout tasks required in the Contract Documents and as required for the Work.
2. CONTRACTOR's surveyor shall possess not less than five years of experience performing duties similar in scope and extent to those required of CONTRACTOR's surveyor on this Project.
3. Surveyor shall be a professional land surveyor registered and licensed in the State of New York, or a professional engineer registered and licensed as a professional engineer in the State of New York and authorized under Laws and Regulations to practice surveying.

B. Responsibilities of Contractor's Surveyor:
1. Providing required surveying equipment, including transit, theodolite, or total station; level; stakes; and surveying accessories.
2. Establishing required lines and grades for constructing all facilities, structures, pipelines, and site improvements, including outdoor electrical equipment and feeders.
3. Preparing and maintaining professional-quality, accurate, well-organized, legible notes of all measurements and calculations made while surveying and laying out the Work.
4. Prior to backfilling operations, survey, locate, and record on a copy of the Contract Documents accurate representation of buried Work and Underground Facilities provided and encountered.
5. Locating on a site plan of the Site the actual location of above-ground Work to be indicated on record documents.
6. Complying with requirements of the Contract Documents relative to surveying and related Work, including requirements of this Section's Articles 1.5 and 3.1.

1.5 RECORDS

A. Records – General:
1. Maintain at the Site a complete and accurate log of control and survey Work as such Work progresses.

B. Field Books and Records:
   1. Survey data and records shall be in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the locality where the Site is located.
   2. Original field notes, computations, and other surveying data shall be recorded by CONTRACTOR's surveyor in CONTRACTOR-furnished hard-bound field books, and shall be signed and sealed by CONTRACTOR's surveyor.
   3. Completeness and accuracy of survey Work, and completeness and accuracy of survey records, including field books, shall be responsibility of CONTRACTOR.
   4. Failure to organize and maintain survey records in an appropriate manner that allows reasonable and independent verification of calculations, and to allow identification of elevations, dimensions, and grades of the Work, shall be cause for rejecting the survey records, including field books.
   5. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by ENGINEER.

C. Certified Survey of Surface Structures:
   1. Upon completion of foundation walls and major site improvements, prepare a certified survey, signed and sealed by professional surveyor, showing or indicating dimensions, locations, angles and elevations of construction and locations and elevations of Underground Facilities installed and encountered during the Work.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SURVEYING

A. Reference Points:
   1. Refer the General Clauses for requirements regarding reference points.
   2. OWNER's established reference points that are damaged or destroyed by CONTRACTOR will be re-established by OWNER at CONTRACTOR's expense. OWNER may deduct from payments owed CONTRACTOR such amounts as set-offs in accordance with the Contract Documents.
   3. From OWNER-established reference points, establish lines, grades, and elevations necessary to control the Work. Obtain measurements required for executing the Work to tolerances specified in the Contract Documents.

4. Establish, place, and replace as required, such additional stakes, markers, and other reference points necessary for control, intermediate checks, and guidance of construction operations.

B. Surveys to Determine Quantities for Payment:
   1. For each application for progress payment, perform such surveys and computations necessary to determine quantities of Work performed or placed. Perform surveys necessary for ENGINEER to determine final quantities of Work in place.
   2. Notify ENGINEER not less than 24 hours before performing survey services for determining quantities to be included in Application for Payment. Unless waived in writing by ENGINEER, perform quantity surveys in presence of ENGINEER or Resident Project Representative (if any).

C. Construction Surveying: Comply with the following:
   1. Alignment Staking: Provide alignment stakes at 50-foot intervals on tangent, and at 25-foot intervals on curves.
   2. Slope Staking: Provide slope staking at 50-foot intervals on tangent, and at 25-foot intervals on curves. Re-stake at every ten-foot difference in elevation.
   3. Structure: Stake-out structures, including elevations, and check prior to and during construction.
   4. Pipelines: Stake-out pipelines including elevations, and check prior to and during construction.
   5. Roads, Drives, and Paved Areas: Stake-out roadway, driveway, and paved area elevations at 50-foot intervals on tangent, and at 25-foot intervals on curves.
   6. Cross-sections: Provide original, intermediate, and final staking as required, for site work other locations as necessary for quantity surveys.
   7. Easement Staking: Provide easement staking at 50-foot intervals on tangent, and at 25-foot intervals on curves. Also provide wooden laths with flagging at maximum intervals of 100 feet.
   8. Record Staking: Provide permanent stake at each blind flange and each utility cap provided for future connections. Stakes for record staking shall be material acceptable to ENGINEER.

D. Accuracy:
   1. Establish CONTRACTOR's temporary survey references points for CONTRACTOR’s use to not greater than second-order accuracy (e.g., 1:10000). Construction staking used as a guide for the Work shall be set at not greater than third-order accuracy (e.g., 1:5000). Basis on which such orders are established shall provide the absolute margin for error specified below.
   2. Horizontal accuracy of easement staking shall be plus or minus 0.1 feet. Accuracy of other staking shall be plus or minus 0.04 feet horizontally and plus or minus 0.02 feet vertically.
   3. Survey calculations shall include an error analysis sufficient to demonstrate required accuracy.

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SECTION 01 71 33

PROTECTION OF THE WORK AND PROPERTY

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for safety and protection that augment the requirements of the General Clauses. This Section also includes requirements for barricades and warning signals, and protection of trees and plants, existing structures, floors, roofs, installed items, and landscaping.
   2. CONTRACTOR shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect personnel health and safety, and to protect the Work and all public and private property and facilities from damage, as specified in the General Clauses, Supplementary Conditions, and the Specifications.
   3. To prevent damage, injury, or loss, CONTRACTOR's actions shall include the following:
      a. Provide measures for safety of personnel at the Site, including workers engaged in the Work, delivery personnel, testing and inspection personnel, personnel of authorities having jurisdiction, other visitors to the Site, the public, OWNER's personnel, facility manager's personnel (if different from OWNER), ENGINEER, and Resident Project Representative (if any).
      b. Storing apparatus, materials, supplies, and equipment in an orderly, safe manner that does not unduly interfere with progress of the Work or work of other contractors, utility owners, and owners of transportation rights-of-way.
      c. Providing suitable storage facilities for materials and equipment subject to damage or degradation by exposure to climate, temperature, theft, breakage, or other cause.
      d. Placing upon the Work or any part thereof only loads consistent with the safety and integrity of that portion of the Work and existing construction.
      e. Frequently removing and disposing of refuse, rubbish, scrap materials, and debris caused by CONTRACTOR's operations so that, at all times, the Site is safe, orderly, and workmanlike in appearance.
      f. Providing temporary barricades, fencing, and guard rails around the following: openings, scaffolding, temporary stairs and ramps, around excavations, for elevated walkways, and other areas that may present a fall-hazard or hazard to vehicles.
   4. Do not, except after written consent from proper parties, enter or occupy privately-owned property or premises with personnel, tools, materials or equipment, except on lands and easements provided by OWNER.
   5. CONTRACTOR has full responsibility for preserving public and private property and facilities on and adjacent to the Site. Direct or indirect damage

done by, or on account of, any act, omission, neglect, or misconduct by CONTRACTOR in executing the Work, shall be remedied by CONTRACTOR, at his expense, to condition equal to that existing before damage was done.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 BARRICADES AND WARNING SIGNALS

A. Barricades and Warning Signals – General:
   1. Where the Work is performed on or adjacent to roadway, access road or driveway, right-of-way, or public place:
      a. Provide temporary barricades, fences, lights, warning signs, danger signals, watchmen, and take other precautionary measures for protecting persons, property, and the Work.
      b. Use appropriately colored and reflective barricades, or paint barricades accordingly, to be visible at night.
      c. From sunset to sunrise, provide and maintain not less than one temporary light at each barricade.
      d. Erect sufficient barricades to keep vehicles from being driven on or into Work under construction.
      e. Furnish watchmen in sufficient numbers to protect the Work.
   2. Provide temporary barricades to protect personnel and property for Work not in or adjacent to transportation routes and vehicular travel areas, including indoor work, in accordance with Laws and Regulations.
   3. CONTRACTOR's responsibility for maintaining temporary barricades, signs, lights, and for providing watchmen shall continue until the Work is substantially complete in accordance with the Contract Documents, unless other provision for security and protection is agreed to by the parties. After Substantial Completion, protect Work and property during periods when final Work or corrective Work is underway.

B. Temporary Fencing: Refer to Section 01 57 33, Security.

3.2 TREE AND PLANT PROTECTION

A. Tree and Plant Protection – General:
   1. Protect existing trees, shrubs, and plants on or adjacent to the Site, shown or designated to remain in place, against unnecessary cutting, breaking, damage, or skinning of trunk, branches, bark, and roots.
   2. Do not store materials or equipment or park construction equipment and vehicles within foliage drip lines.

3. In areas subject to traffic, provide temporary fencing or temporary barricades to protect trees and plants.
4. Open fires are not allowed onsite.
5. Within the limits of the Work, water trees and plants that are to remain to maintain their health during construction operations.
6. Cover exposed roots with burlap, and keep such burlap continuously wet. Cover exposed roots with earth as soon as possible. Protect root systems from mechanical damage and damage by erosion, flooding, runoff, and noxious materials in solution.
7. If branches or trunks are damaged, prune branches immediately and protect cut or damaged areas with emulsified asphalt compounded specifically for horticultural use, in manner acceptable to ENGINEER.
8. When directed by ENGINEER, remove and dispose of at location away from the Site damaged trees and plants that die or suffer permanent injury, and replace each damaged tree or plant with specimen of equal or better species and quality.
9. Coordinate Work in this Article with the following Specifications:
    a. Section 32 01 91, Tree Protection and Trimming.

3.3 PROTECTION OF EXISTING STRUCTURES

A. Underground Facilities:
1. Underground Facilities known to OWNER and ENGINEER, except water, gas, sewer, electric, and communications services to individual buildings and properties, are shown. Information shown for Underground Facilities is the best available to OWNER and ENGINEER but, in accordance with the General Conditions, as may be modified by the Supplementary Conditions, is not guaranteed to be correct or complete.
2. CONTRACTOR shall explore ahead of trenching and excavating Work and shall sufficiently uncover Underground Facilities that will or may interfere with the Work to determine their location, to prevent damage to Underground Facilities, and to prevent service interruption to structures and properties served by Underground Facilities. If CONTRACTOR damages an Underground Facility, CONTRACTOR shall restore it to its pre-construction condition, in accordance with requirements of the owner of the damaged facility and the Contract Documents.
3. Necessary changes in the location of the Work may be directed by ENGINEER to avoid Underground Facilities not shown or indicated on the Contract Documents.
4. If permanent relocation of an existing Underground Facilities is required and is not otherwise shown or indicated in the Contract Documents, CONTRACTOR may be directed in writing to perform the required work. When such relocation Work results in a change in the Contract Price, Contract Times, the associated Contract modification procedures and payment for such Work shall be in accordance with the Contract Documents.

B. Surface Structures:

1. Surface structures are existing buildings, structures, and other facilities at or above ground surface, including their foundations and any extension below ground surface. Surface structures include, but are not limited to, buildings, tanks, walls, bridges, roads, dams, channels, open drainage routes, exposed piping and utilities, poles, exposed wires, posts, signs, markers, curbs, walks, fencing, and other facilities visible at or above ground surface.
2. Existing surface facilities, including but not limited to guard rails, posts, guard cables, signs, poles, markers, curbs, and fencing, that are temporarily removed to facilitate the Work shall be replaced and restored to their pre-construction condition at CONTRACTOR's expense.

C. Protection of Underground Facilities and Surface Structures:
1. CONTRACTOR shall sustain in their places and protect from direct or indirect injury all Underground Facilities and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure or facility.
2. Before proceeding with the Work of sustaining and supporting such structure or facility, CONTRACTOR shall satisfy ENGINEER that methods and procedures to be used have been approved by party owning same.
3. CONTRACTOR shall bear all risks attending the presence or proximity of all Underground Facilities and surface structures within or adjacent to limits of the Work, in accordance with the Contract Documents.
4. CONTRACTOR shall be responsible for damage and expense for direct or indirect injury, caused by CONTRACTOR's activities, to structures and facilities. CONTRACTOR shall promptly repair damage caused by CONTRACTOR's activities, to the satisfaction of owner of damaged structure or facility.
5. Protection of Underground Facilities Under Roads and Parking Areas: Provide temporary, heavy-duty steel roadway plates to protect existing manholes, handholes, valve boxes, vaults, and other Underground Facilities near to or visible at the ground surface.

3.4 PROTECTION OF FLOORS AND ROOFS

A. Protection of Floors and Roofs – General:
1. Use proper protective covering when moving equipment, handling materials or other loads, when painting, handling mortar or grout, and when cleaning walls, ceilings, or structure contents.
2. Use metal pans to collect oil and cuttings from piping, conduits, and rod threading machines, and under metal cutting machines.
3. Do not load concrete floors less than 28 days old without written permission of ENGINEER. Do not load floors, roofs, or slabs in excess of design loading.
4. Do not load roofs without written permission of ENGINEER.
5. Restrict access to roofs, and keep CONTRACTOR personnel off existing roofs, except as required for the Work.

6. If access to roofs is required, roofing, parapets, openings, and all other construction on or adjacent to roof shall be protected with suitable plywood or other acceptable means.

3.5 PROTECTION OF INSTALLED MATERIALS, EQUIPMENT, AND LANDSCAPING

A. Protect installed Work to prevent damage from subsequent operations. Remove protective items when no longer needed, prior to Substantial Completion of the Work.

B. Control traffic to prevent damage to equipment, materials, and surfaces.

C. Coverings:
   1. Provide temporary coverings to protect materials and equipment from damage.
   2. Cover projections, wall corners and jambs, sills, and soffits of openings, in areas used for traffic and for passage of materials and equipment in subsequent work.

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SECTION 01 73 19

INSTALLATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section describes general requirements for installing materials and equipment. Additional installation requirements are included in the various Specifications Sections in Divisions 02 through 49 and elsewhere in the Contract Documents.
   2. CONTRACTOR shall provide all labor, materials, equipment, services, tools, and incidentals required to install materials and equipment.

1.2 QUALITY ASSURANCE

A. General:
   1. Provide appropriate quality assurance for installing materials and equipment, and provide quality control over Suppliers, materials and equipment, services, Site conditions, and workmanship, to provide Work of the required quality.

B. Qualifications:
   1. Installer:
      a. Installers shall be experienced in the types of Work required, including, but not limited to, the requirements of Section 01 42 00, References, and the Division 02 through 49 Specifications where the particular element of the Work is specified.

C. Regulatory Requirements: Comply with the following:
   1. 29 CFR 1910, OSHA.

PART 2 – PRODUCTS

2.1 EQUIPMENT DRIVE GUARDS

A. Equipment Drive Guards – General:
   1. Unless otherwise shown or indicated, provide all-metal guards complying with 29 CFR 1910, Subpart O, with equipment driven by open shafts, belts, chains, pulleys, sheaves, or gears. Guards shall enclose drive and driven mechanism.
   2. If material of guards are not otherwise specified, guards shall be galvanized sheet steel, galvanized woven wire, or expanded metal set in a frame of galvanized steel members, as appropriate.
   3. Secure guards in position by steel braces or straps, securely fastened to frame of equipment, floor, or wall as required.

4. Fastenings shall allow removal of guards for servicing equipment.

2.2 MISCELLANEOUS MATERIALS

A. Shims shall be Type 304L stainless steel, clean and free of slag.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:
   1. Installation Instructions and Requirements:
      a. Install materials and equipment in accordance with approved Shop Drawings and CONTRACTOR's other submittals approved by ENGINEER, the Contract Documents, and manufacturer's installation instructions. When manufacturer's installation instructions conflict with the Contract Documents, obtain interpretation or clarification from ENGINEER before proceeding.
      b. Manufacturer's installation instructions include manufacturer's written instructions; drawings; illustrative, wiring and schematic diagrams; diagrams identifying external connections, terminal block numbers and internal wiring; and other such information pertaining to installation of materials and equipment. Included are all of manufacturer's printed installation instructions, including those that may be attached to equipment upon delivery.
   2. Prior to installing materials and equipment, complete preparation of surfaces on which materials and equipment are to be installed. Prior to installing materials and equipment on new concrete, concrete shall achieve sufficient compressive strength to support the materials and equipment.
   3. Maintain the work area in a broom-clean condition while installing materials and equipment.
   4. Use proper tools to assemble materials and equipment. Do not deform or mar surface of shafts, nuts, and other parts.
   5. Do not support rigging from building or structure without written permission of ENGINEER. CONTRACTOR is responsible for and shall repair damage to building or structure resulting from CONTRACTOR's operations, in accordance with Section 01 71 33, Protection of the Work and Property.
   6. During installation, maintain materials and equipment in neutral position and do not exert undue stress on materials and equipment.
   7. Tighten connections requiring gaskets evenly all around to ensure uniform stress over entire gasket.
   8. Use only an oil bath heater to expand couplings, gears, and other mechanical components to be expanded for installation. Do not force or drive couplings, gears, and other mechanical components onto equipment shafts, or subject such items to open flame or torch.

9. Do not alter or repair materials and equipment and do not burn or weld materials and equipment unless required in the Contract Documents or allowed by ENGINEER.
10. Provide plugs in lubrication holes to prevent entry of foreign matter.

B. Setting and Erection:
   1. Install materials and equipment plumb, level, true, and free of rack unless 1otherwise shown or indicated, and demonstrate plumbness and level to ENGINEER. Bring parts to proper bearing after installation and erection.
   2. Anchorages:
      a. Provide anchorage setting drawings in time to coordinate with fabrication of materials and equipment and the Work.
      b. Anchorages shall comply with Section 05 05 33, Anchor Systems. Requests for approval of substitute materials or methods of anchorage shall be in accordance with the General Clauses, and Section 01 25 00, Substitution Procedures.
   3. Shimming:
      a. Wedging is not allowed.
      b. During installation, use the minimum number of shims required for leveling the equipment.
      c. Provide shims, filling pieces, keys, packing, grouting of the type required by the Contract Documents, and other materials and equipment necessary to properly align, level, and secure apparatus in place.
   4. Installing Equipment onto Foundations:
      a. Using experienced millwrights, carefully set and align equipment on foundations, after equipment soleplates or baseplates (as applicable) have been shimmed to true alignment at anchorages.
      b. Set anchorages in place and tighten nuts against shims.
      c. Check bedplates or wing feet of equipment after securing to foundations and, after confirming alignments, grout soleplates or baseplates (as applicable) in place in accordance with the Contract Documents.
   5. Ream misaligned holes. Do not “force” bolts or keys.
   6. Where applicable, properly align equipment with associated piping and utility connections, without exerting undue stress on connecting piping and utilities.

C. Alignment and Leveling:
   1. Verify that all shafts, couplings, and sheaves are properly aligned and adjust to required tolerances.
   2. Align couplings while equipment is free of external loads.
   3. Check angular and parallel alignment and record actual alignment and submit to ENGINEER. Alignment shall be within tolerances specified in Contract Documents and as recommended by Supplier of the material or equipment item.
   4. Use laser indicators or dial indicators for checking angular and parallel alignment. Using dial indicators requires that, during rotation of half-couplings in performing testing, dial indicator shall be maintained in same relative

position, and dial indicator readings taken at same place on circumference of coupling.

D. Threaded Connections:
   1. Apply a molybdenum disulfide, anti-seize compound to threads in mechanical connections such as bolts, studs, cap screws, tubing, and other threads, unless otherwise shown or indicated.

3.2 FIELD QUALITY CONTROL

A. Supplier's Services:
   1. When specified, provide competent, qualified representatives of material or equipment Supplier to perform services required, including: supervising installation, checking the completed installation, adjusting, testing of materials and equipment, and where required instructing operations and maintenance personnel in the use and care of materials and equipment.

+ + END OF SECTION + +

SECTION 01 73 24

CONNECTIONS TO EXISTING FACILITIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for connections to existing facilities. Requirements for tie-ins and shutdowns necessary to complete the Work are in Section 01 14 16, Coordination with Owner's Operations.
   2. CONTRACTOR shall provide labor, materials, tools, equipment, and incidentals shown, specified, and required for performing connections to existing facilities.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate Work that will be performed with or before the Work specified in this Section.

C. Related Sections:
   1. Section 01 14 16, Coordination with Owner's Operations.
   2. Section 01 51 41, Temporary Pumping.
   3. Section 01 73 29, Cutting and Patching.

D. General:
   1. Requirements for shutdowns, tie-ins, and other provisions on connections to existing facilities, are indicated in Section 01 14 16, Coordination with Owner's Operations.
   2. Requirements for temporary pumping for connections to existing facilities are in Section 01 14 16, Coordination with Owner's Operations, and Section 01 51 41, Temporary Pumping.
   3. Requirements for cutting and patching are in Section 01 73 29, Cutting and Patching.
   4. To extent possible, materials, equipment, systems, piping, and appurtenances that will be placed into service upon completion of connection to existing facilities shall be checked, successfully tested, and in condition for operation prior to making connections to existing facilities, if valves, gates, or similar watertight and gastight isolation devices are not provided at the connection point.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

+ + END OF SECTION + +

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes general requirements for cutting and patching Work.
   2. CONTRACTOR shall perform cutting and coring, and rough and finish patching of holes and openings in existing construction.
   3. Provide cutting, coring, fitting and patching, including attendant excavation and fill, required to complete the Work, and to:
      a. remove and replace defective Work;
      b. remove samples of installed Work as specified or required for testing;
      c. remove construction required to perform required alterations or additions to existing construction;
      d. uncover the Work for ENGINEER's observation of covered Work, testing or inspection by testing entities, or observation by authorities having jurisdiction;
      e. connect to completed Work not performed in proper sequence;
      f. remove or relocate existing utilities and piping that obstruct the Work in locations where connections are to be made;
      g. make connections or alterations to existing or new facilities.

1.2 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Cutting and Patching Request:
      a. Submit written request to ENGINEER, well in advance of executing cutting or alteration that affects one or more of the following:
         1) Design function or intent of Project.
         2) Work of OWNER or other contractors.
         3) Structural value or integrity of an element of the Project.
         4) Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
         5) Efficiency, operational life, maintenance, or safety of operational elements.
         6) Visual qualities of sight-exposed elements.
      b. Request shall include:
         1) Identification of Project and Contract designation.
         2) Description of affected Work of CONTRACTOR and work of others (if any).
         3) Necessity for cutting.

4) Effect on work or operations of OWNER, other contractors (if any), and on structural or weatherproof integrity of Project.
5) Description of proposed Work, describing: scope of cutting and patching; trades who will be executing the Work; materials and equipment to be used; extent of refinishing; schedule of operations; alternatives to cutting and patching, if any, and net effect on aesthetics following completion of finishing Work.
7) Designation of entity responsible for cost of cutting and patching, when applicable.
8) Written permission of other prime contractors (if any) whose work will or may be affected.

2. Recommendation Regarding Cutting and Patching:
   a. Should conditions of work or schedule indicate a change of materials or methods, submit written recommendation to ENGINEER including:
      1) Conditions indicating change.
      2) Recommendations for alternative materials or methods.
      3) Items required with request for approval of substitute, in accordance with the substitution request requirements of the Contract Documents.
3. Product Data:
   a. Submit manufacturer's data for the protective compound to be applied to core-drilled surfaces and cut concrete surfaces.
   b. When not required under other Sections, submit manufacturer's data on materials to be used for finishing around the cut or patched area.
   c. Furnish submittals for patching materials under the associated Specifications Section.

B. Informational Submittals: Submit the following:
1. Written Notification of Cutting and Patching:
   a. Submit written indication designating the day and time that the construction associated with cutting and patching will be uncovered to allow for observation. Do not begin cutting or patching operations until submittal is accepted by ENGINEER.
2. X-ray Investigations:
   a. Proposed method of investigation. Submit and obtain ENGINEER's acceptance prior to performing X-ray inspections.
   b. Report of X-ray evaluation of slabs, floors, and walls to be cut or core-drilled.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials - General:
1. Use materials that comply with the Contract Documents.
2. If not shown or indicated in the Contract Documents, use materials that are identical to existing materials affected by cutting and patching Work.

3. For exposed surfaces, use materials that visually match existing adjacent surfaces to fullest extent possible. If identical materials are unavailable or cannot be used, use materials whose installed performance will equal or surpass that of existing materials.
4. Replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, using materials that do not void required or existing warranties.

B. Compound Applied to Core-Drilled Surfaces and Cut Concrete Surfaces:
1. After core-drilling and before installing the utility or equipment through the penetration, coat exposed concrete and steel with solvent-free, two-component, protective, epoxy resin coating.
2. Color shall approximate the finish color of the existing surface to be coated.
3. Product and Manufacturer: Provide one of the following:
a. Sikagard 62, by Sika Corporation.
b. Or equal.

PART 3 – EXECUTION

3.1 GENERAL

A. Perform cutting and coring in such manner that limits extent of patching required.

B. Structural Elements:
1. Do not cut or patch structural elements in manner that would change the element's structural load-carrying capacity as load deflection ratio.

C. Operating Elements:
1. Do not cut or patch operating elements in manner that would reduce their capacity to perform as intended.
2. Do not cut or patch operating elements or related components in manner that would increase maintenance requirements or decrease operational life or safety.

D. Replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, using methods that do not void required or existing warranties.

3.2 INSPECTION

A. Examine surfaces to be cut or patched, and conditions under which cutting or patching will be performed before starting cutting or patching Work.

B. Report unsatisfactory or questionable conditions to ENGINEER in writing. Do not proceed with cutting or patching Work until unsatisfactory conditions are corrected.

C. Non-Destructive Investigation:

1. In advance of cutting or coring through existing slabs or walls, use X-ray or other non-destructive methods accepted by ENGINEER to determine location of reinforcing steel, electrical conduits, and other items embedded in slabs or walls.
2. Submit to ENGINEER written report of findings of evaluation.
3. Perform X-ray investigation and submit results to ENGINEER sufficiently in advance of cutting Work to allow time to identify and implement alternatives, if changes to the Work are necessary because of conduit or other features in floor or wall.

3.3 PREPARATION

A. Provide temporary support required to maintain structural integrity of facilities, to protect adjacent work from damage during cutting, and to support the element(s) to be cut.

B. Protection of Existing Construction during Cutting and Patching:
   1. Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project and facility that will be exposed during cutting and patching operations.
   2. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
   3. Do not cut existing pipe, conduit, ductwork, or other utilities serving facilities scheduled to be removed or relocated until provisions have been made to bypass them.

3.4 CORING

A. Use core-drilling to make penetrations through concrete and masonry walls, slabs, or arches, unless otherwise accepted by ENGINEER in writing.

B. Coring:
   1. Perform coring with non-impact rotary tool using diamond core-drills. Size holes for pipe, conduit, sleeves, equipment or mechanical seals, as required, to be installed through the penetration.
   2. Do not core-drill through electrical conduit or other utilities embedded in walls or slabs without approval of ENGINEER. To extent possible, avoid cutting reinforcing steel in slabs and walls.

C. Protection:
   1. Protect existing equipment, utilities, and adjacent areas from water and other damage caused by or resulting from core-drilling operations.
   2. After core-drilling and before installing the utility or equipment through the penetration, coat exposed concrete and steel with protective coating material indicated in Paragraph 2.1.B of this Section. Apply protective coating in accordance with manufacturer's instructions.

D. Cleaning:
   1. After core-drilling, vacuum or otherwise remove slurry and tailings from the work area.

3.5 CUTTING

A. Cutting – General:
   1. Cut existing construction using methods least-likely to damage elements retained and adjoining construction and that provide proper surfaces to receive subsequent installation or repair.
   2. In general, use hand tools or small power tools suitable for sawing or grinding. When possible, avoid using hammering and avoid chopping.
   3. Cut holes and slots as small as possible, neatly to the size required, and with minimum disturbance of adjacent surfaces.
   4. Prior to starting cutting, provide adequate bracing of area to be cut.
   5. To avoid marring existing finished surfaces, cut or drill from exposed or finished side into concealed side.
   6. Provide equipment of adequate size to remove the cut panel or "coupon".
   7. Provide temporary covering over cut openings where not in use.

B. Cutting – Concrete and Masonry:
   1. Cut through concrete and masonry using concrete wall saw with diamond saw blades.
   2. On both of the element being cut, provide for control of slurry generated during sawing.
   3. After cutting concrete and before installing subsequent construction on or through the opening, coat exposed concrete and steel with protective coating material indicated in Paragraph 2.1.B of this Section. Apply protective coating in accordance with manufacturer's instructions.

3.6 PATCHING

A. Patching – General:
   1. Patch construction by filling, repairing, refinishing, closing-up, and similar operations following performance of other Work.
   2. Patch with durable seams that are as inconspicuous as possible. Provide materials and comply with installation requirements indicated in the Contract Documents.
   3. Patch to provide airtight and watertight connections to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
   4. Where feasible, test patched areas to demonstrate integrity of installation.

B. Restoration:
   1. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in manner that eliminates evidence of patching and refinishing.
   2. For continuous surfaces, refinish to nearest intersection.

3. For an assembly, refinish the entire unit that was patched.
4. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 CLEANING

A. Cleaning and Restoration:
   1. Clean areas and spaces where cutting, coring, or patching were performed.
   2. Clean piping, conduit, and similar constructions before applying paint or other finishing materials.
   3. Restore damaged coverings of pipe and other utilities to original condition.

+ + END OF SECTION + +

SECTION 01 74 05

CLEANING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for keeping the Site free of accumulations of waste materials during construction ("progress cleaning") and cleaning for Substantial Completion and prior to final inspection (collectively, "closeout cleaning").
   2. CONTRACTOR shall perform cleaning during the Project, including progress cleaning, upon completion of the Work, and as required by the General Clauses and this Section.
   3. Maintain in a clean manner the Site, the Work, and areas adjacent to or affected by the Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. NFPA 241, Safeguarding Construction, Alteration, and Demolition Operations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PROGRESS CLEANING

A. General:
   1. Clean the Site, work areas, and other areas occupied by CONTRACTOR not less than weekly. Dispose of materials in accordance with the General Conditions, as may be modified by the Supplementary Conditions, and the following:
      a. Comply with NFPA 241 for removing combustible waste materials and debris.
      b. Do not hold non-combustible materials at the Site more than three days if the temperature is expected to rise above 80 degrees F. When temperature is less than 80 degrees F, dispose of non-combustible materials within seven days of their generation.
      c. Provide suitable containers for storage of waste materials and debris.
      d. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately.

B. Site:
   1. Keep outdoor, dust-generating areas wetted down or otherwise control dust emissions.
   2. Not less than weekly, brush-sweep roadways and paved areas at the Site that are used by construction vehicles or otherwise affected by construction activities.
   3. Comply with dust control requirements of Section 01 57 05, Temporary Controls.

C. Work Areas:
   1. Clean areas where the Work is in progress to maintain the extent of cleanliness necessary for proper execution of the Work.
   2. Remove liquid spills promptly. Immediately report spills to OWNER, ENGINEER, and authorities having jurisdiction, in accordance with the Contract Documents and Laws and Regulations.
   3. Where dust would impair proper execution of the Work, broom-clean or vacuum entire work area, as appropriate.
   4. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

D. Installed Work:
   1. Keep installed Work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of material or equipment installed, using only cleaning agents and methods specifically recommended by material or equipment manufacturer. If manufacturer does not recommend specific cleaning agents or methods, use cleaning agents and methods that are not hazardous to health and property and that will not damage exposed surfaces.

E. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration until Substantial Completion.

F. Cutting and Patching:
   1. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, trailings and cuttings, and similar materials.
   2. Thoroughly clean piping, conduits, and similar features before applying patching material, paint, or other finishing materials. Restore damaged coverings on piping, ducting, and similar items to its pre-construction condition.

G. Cleaning of Hydraulic Structures: Clean hydraulic structures that will contain fluid, such as tanks and channels, in accordance with this Section and Section 01 45 53, Cleaning, Testing, and Disinfecting Hydraulic Structures.

H. Waste Disposal:
   1. Properly dispose of waste materials, surplus materials, debris, and rubbish off the Site.

2. Do not burn or bury rubbish and waste materials at the Site.
3. Do not discharge volatile or hazardous substances, such as mineral spirits, oil, or paint thinner, into storm sewers or sanitary sewers.
4. Do not discharge wastes into surface waters or drainage routes.
5. CONTRACTOR is solely responsible for complying with Laws and Regulations regarding storing, transporting, and disposing of waste generated by CONTRACTOR's operations or brought to the Site by CONTRACTOR.

I. During handling and installation of materials and equipment, clean and protect construction in progress and adjoining materials and equipment already in place. Apply protective covering where required for protection from damage or deterioration, until Substantial Completion.

J. Clean completed construction as frequently as necessary throughout the construction period.

3.2 CLOSEOUT CLEANING

A. Complete the following prior to requesting inspection for Substantial Completion:
1. Clean and remove from the Site rubbish, waste material, debris, and other foreign substances.
2. Sweep paved areas broom-clean. Remove petrochemical spills, stains, and other foreign deposits.
3. Hose-clean sidewalks and loading areas.
4. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
5. Leave surface waterways, drainage routes, storm sewers, and gutters open and clean.
6. Repair pavement, roads, sod, and other areas affected by construction operations and restore to specified condition; if condition is not specified, restore to pre-construction condition.
7. Clean exposed exterior and interior hard-surfaced finishes to dirt-free condition, free of spatter, grease, stains, fingerprints, films, and similar foreign substances.
8. Clean, wax, and polish wood, vinyl, and painted floors.
9. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, and similar spaces.
10. In unoccupied spaces, sweep concrete floors broom-clean.
11. Clean transparent materials, including mirrors and glazing in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
12. Remove non-permanent tags and labels.
13. Surface Finishes:
    a. Touch-up and otherwise repair and restore chipped, scratched, dented or otherwise marred surfaces to specified finish and match adjacent surfaces.

b. Do not paint over “UL” or similar labels, including mechanical and electrical nameplates.

14. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint, and mortar droppings, and other foreign substances.
15. Clean plumbing fixtures to sanitary condition, free of stains, including stains resulting from water exposure.
16. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
17. Clean lighting fixtures, lamps, globes, and reflectors to function with full efficiency. Replace temporary lamps provided in permanent fixtures. Replace existing lighting fixture components that are burned out or noticeably dimmed from use during construction. Replace defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
18. Leave the Site clean, and in neat, orderly condition, satisfactory to OWNER and ENGINEER.

B. Complete the following prior to requesting final inspection:
   1. Following completion of the Work on the “punch list” of Work uncompleted at Substantial Completion, clean in accordance with Paragraph 3.2.A of this Section.

+ + END OF SECTION + +

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall comply with the requirements and procedures for construction waste management and disposal, including:
      a. Minimizing construction waste and debris and reusing, salvaging, and recycling to specified extent.
      b. Developing and implementing a plan for construction waste management and disposal.
   2. Extent of required construction waste management and disposal includes:
      a. Construction waste management disposal within the Project limits, as shown or indicated.
   3. This Section includes administrative and procedural requirements for:
      a. Salvaging non-hazardous demolition and construction waste.
      b. Recycling non-hazardous demolition and construction waste.
      c. Disposing of non-hazardous demolition and construction waste.

B. Coordination:
   1. Coordinate salvaging, recycling, and disposing of waste as specified under this and other Sections.

C. Related Sections:
   1. 01 31 13, Project Coordination.

D. Practice efficient waste management in using materials in the Work. Employ reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling of materials.

1.2 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. "Waste Management Coordinator" is the person responsible for implementing, monitoring, and reporting the status of the Waste Management Plan. Although available for other assignments, the Waste Management Coordinator shall be present at the Site full time for the duration of the Work.
   2. "Construction waste" is building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
   3. "Demolition waste" is building and site improvement materials resulting from demolition or selective demolition operations.

4. "Disposal" is removal to an off-Site location of demolition and construction waste and subsequent sale, recycling, reuse, or disposal in a landfill or incinerator conforming to Laws and Regulations and acceptable to authorities having jurisdiction.
5. "Recycle" is recovery of demolition waste or construction waste for subsequent processing in preparation for reuse.
6. "Salvage' is recovery of demolition or construction waste and subsequent sale or reuse in another facility.
7. "Salvage and reuse" is recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Refrigerant Recovery Technician: Shall be certified via a U.S. EPA-approved certification program.

B. Regulatory Requirements: Comply with hauling and disposal Laws and Regulations of authorities having jurisdiction.

C. Pre-construction Waste Management Coordination Conference: Within 14 days of the date the Contract Times commence running and before beginning Work at the Site, attend waste management coordination conference at the Site, in accordance with Section 01 31 13, Project Coordination. Purpose of conference is to review methods and procedures related to waste management including, but not limited to:

1.4 DELIVERY, STORAGE, AND HANDLING

A. Salvage Materials: Provide protective handling and storage as required for all items identified in the Contract Documents for salvage and reuse.

B. Recyclable Waste: On daily basis remove all recyclable materials identified in the waste management plan from the work area in acceptable containers.

C. Provide separate collection containers as required by recycling haulers and to prevent contamination of materials, including protection from the elements as applicable.

D. Replace loaded containers with empty containers as demand requires, at least weekly.

E. Handling: Deposit recyclable materials in containers in clean (no mud, adhesives, solvents, petroleum contamination), debris-free condition.

F. If contamination chemically combines with materials so that materials cannot be cleaned, do not deposit into recycle containers.

G. Environmental Requirements: Transport recyclable waste materials from the work area to recycle containers, and carefully deposit in containers in manner to minimize noise and dust. Close the covers of container immediately after materials are deposited. Do not place recyclable waste materials on the ground adjacent to container.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement the waste management plan approved by ENGINEER. Provide handling, containers, storage, signage, transportation, and other items required to implement the waste management pan during the Project.

B. Training: Train all installers, Subcontractors, and Suppliers as required on proper waste management procedures required for the Work.
   1. Distribute the waste management plan as required within three days of ENGINEER's approval.
   2. Distribute the waste management plan to CONTRACTOR's personnel, Subcontractors, and Suppliers prior to these entities starting the Work. Review with installers, Subcontractors, and Suppliers the waste management plan's procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent facilities.
   1. Designate and label specific areas of the Site necessary for separating materials to be salvaged, recycled, reused, donated, or sold.
   2. Provide temporary controls in accordance with the Contract Documents.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:
   1. Clean salvaged items before reusing.
   2. Pack or crate salvaged items after cleaning. Identify contents of containers.
   3. Store items in secure area until installation.
   4. Protect items from damage during transport and storage.
   5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make salvaged items functional for use indicated.

B. Salvaged Items for Sale and Donation at the Site: Not allowed at the Site. Sale and donations, if done, must be at location other than the Site.

C. Salvaged Items for OWNER's Use:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in secure area until delivery to OWNER.
   4. Transport items to OWNER's storage area designated by OWNER.
   5. Protect items from damage during transport and storage.

D. Plumbing Fixtures: Separate by type and size.

E. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. Recycle paper and beverage containers used by CONTRACTOR's personnel, Subcontractors, and Suppliers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials will accrue to the CONTRACTOR.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at the Site to the maximum extent practical.
   1. Provide appropriately marked containers or bins for controlling recyclable waste until recyclable materials are removed from Site. Provide list of acceptable and unacceptable materials at each container and bin.
      a. Inspect containers and bins for contamination and remove contaminated materials if found.
   2. Stockpile processed materials at the Site without intermixing with other materials. Place, grade, and shape stockpiles to drain water. Cover to prevent dust and blowing debris.
   3. Stockpile materials away from the construction area. Do not store within drip line of trees.
   4. Remove recyclable waste from the Site and from OWNER's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Bituminous Pavement Materials: Grind bituminous pavement into particles of maximum size of 4-inch dimensions.
   1. Break up and transport pavement to asphalt-recycling facility.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
   1. Crush concrete to maximum dimensions of four inches.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
   1. Crush masonry to maximum dimensions of four inches

2. Clean and stack undamaged, whole masonry units on wood pallets.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals:
   1. Separate metals by type.
   2. Structural Steel: Stack steel according to size, type of member, and length.
   3. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, stapes, and accessories.

G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

H. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to the elements.

I. Plumbing Fixtures: Separate by type and size.

J. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

K. Lighting Fixtures: Separate lamps by type and protect from breakage and damage by the elements.

M. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type and protect from the elements.

M. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:
   1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store at dry location.
   2. Polystyrene Packaging: Separate polystyrene materials and store in bags.
   3. Pallets: Require that goods delivered on pallets have the pallets removed from Site, to the extent possible. For pallets that remain at the Site, break down pallets into component wood pieces and comply with requirements for recycling wood.
   4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs (i.e., wood without fasteners or disease) of Lumber: Grind or chip into small pieces.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from the Site and properly dispose of waste in facility such as permitted landfill or incinerator or other method acceptable to authorities having jurisdiction.
   1. Except as otherwise specified, remove from the Site all waste and debris from the Work as it accumulates. Upon completion of the Work, remove materials, equipment, waste, and debris and leave the Site clean, neat, and orderly. Comply with the Contract Documents regarding cleaning and removal of trash, debris, and waste.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials at the Site.

C. Disposal: Transport waste materials to proper location at site other than OWNER's property for disposal in accordance with Laws and Regulations.

+ + END OF SECTION + +

SECTION 01 75 11

CHECKOUT AND STARTUP PROCEDURES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall initially start up and place equipment and systems installed under the Contract into successful operation, in accordance with the equipment manufacturer's written instructions and as instructed by Supplier at the Site.
   2. Provide all material, labor, tools, and equipment required to complete equipment checkout and start-up.
   3. Provide chemicals, lubricants, and other required operating fluids.
   4. Provide fuel, electricity, water, filters, and other expendables required for start-up of equipment, unless otherwise specified.
   5. General activities by CONTRACTOR include the following:
      a. Cleaning, as required under other provisions of the Contract Documents.
      b. Removing temporary protective coatings.
      c. Flushing and replacing lubricants, where required by manufacturer.
      d. Lubrication.
      e. Checking shaft and coupling alignments and resetting where required.
      f. Checking and setting motor, pump, and other equipment rotation, safety interlocks, and belt tensions.
      g. Checking and correcting (as necessary) leveling plates, grout, bearing plates, anchorage devices, fasteners, and alignment of piping, conduits, and ducts that may place stress on the connected equipment.
      h. Performing all adjustments required.

B. Coordination:
   1. Coordinate checkout and start-up with other contractors, as necessary.
   2. Do not start up system or subsystem for continuous operation until all components of that system or subsystem, including instrumentation and controls, have been tested to the extent practicable and proven to be operable as intended by the Contract Documents.
   3. OWNER will furnish sufficient personnel to assist CONTRACTOR in starting up equipment, but responsibility for proper operation is CONTRACTOR's.
   4. Supplier shall be present during checkout, startup, and initial operation, unless otherwise acceptable to ENGINEER.
   5. Startup of heating equipment, air conditioning equipment, and other equipment that provides cooling or other temperature control, and systems is dependent upon the time of year. Return to the Site at beginning of next heating or cooling season (as applicable) to recheck and start the appropriate systems.

6. Do not start up system, unit process, or equipment without submitting acceptable preliminary operations and maintenance manuals by CONTRACTOR in accordance with Section 01 78 23, Operations and Maintenance Data.

C. OWNER's Assumption of Responsibility for Equipment and Systems:
   1. OWNER will assume responsibility for the equipment upon Substantial Completion, unless otherwise mutually agreed upon by OWNER and CONTRACTOR or as documented in the certificate of Substantial Completion.
   2. Before turning over to OWNER responsibility for operating and maintaining system or equipment CONTRACTOR shall:
      a. Provide training of operations and maintenance personnel in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
      b. Complete performance of equipment and system field quality control testing in accordance with the Contract Documents, to the extent possible.
      c. Submit acceptable final operations and maintenance manuals in accordance with Section 01 78 23, Operations and Maintenance Data.
      d. Obtain from ENGINEER final certificate of Substantial Completion for either entire Work or the portion being turned over to OWNER.

1.2 SUBMITTALS

A. Closeout Submittals: Submit the following:
   1. Certifications:
      a. Supplier's certification of installation in accordance with Paragraph 3.1.B of this Section.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 SERVICES OF SUPPLIER

A. When specified, furnish services of competent, qualified representatives of material and equipment manufacturers, including supervising installation, adjusting, checkout, startup, and testing of materials and equipment.

B. Certification:
   1. When services by Supplier are required at the Site, within 14 days after first test operation of equipment, submit to ENGINEER a letter from Supplier, on Supplier's letterhead, stating that materials and equipment are installed in accordance with Supplier's requirements and installation instructions, and in accordance with the Contract Documents.

2. In lieu of Supplier letter, submit completed form attached to this Section.
3. Include in the final operations and maintenance manual for the associated equipment a copy of the letter or completed form, as applicable.

3.2 MINIMUM STARTUP REQUIREMENTS

A. Bearings and Shafting:
1. Inspect for cleanliness, and clean and remove foreign matter.
2. Verify alignment.
3. Replace defective bearings and those that operate in a rough or noisy manner.
4. Grease as necessary, in accordance with manufacturer's recommendations.

B. Drives:
1. Adjust tension in V-belt drives and adjust vari-pitch sheaves and drives for proper equipment speed.
2. Adjust drives for alignment of sheaves and V-belts.
3. Clean and remove foreign matter before starting operation.

C. Motors:
1. Check each motor for comparison to amperage nameplate value.
2. Correct conditions that produce excessive current flow and conditions that exist due to equipment malfunction.

D. Pumps:
1. Check glands and seals for cleanliness and adjustment before running pump.
2. Inspect shaft sleeves for scoring.
3. Inspect mechanical faces, chambers, and seal rings, and replace if defective.
4. Verify that piping system is free of dirt and scale before circulating liquid through pump.

E. Valves:
1. Inspect manual and automatic control valves, and clean bonnets and stems.
2. Tighten packing glands to ensure no leakage, but allow valve stems to operate without galling.
3. Replace packing in valves to retain maximum adjustment after system is determined to be complete.
4. Replace packing on valves that continue to leak.
5. Remove, correct, and replace bonnets that leak.
6. After cleaning, coat packing gland threads and valve stems with surface preparation of "Molycote" or "Fel-Pro".

F. Verify that control valve seats are free of foreign matter and are properly positioned for intended service.

G. Pipe Joints and Other Connections:
1. Tighten flanges and other pipe joints after system has been placed in operation.
2. Replace gaskets that show signs of leakage after tightening.

3. Inspect all joints for leakage.
4. Promptly remake each joint that appears to be faulty; do not wait for rust other corrosion to form.
5. Clean threads on both parts, and apply compound and remake joints.

H. After system has been placed in operation, clean strainers, drives, pockets, orifices, valve seats, and headers in fluid system to ensure freedom from foreign matter.

I. Open steam traps and air vents, where used, and remove operating elements. Clean thoroughly, replace internal parts, and place back into operation.

J. Remove rust, scale, and foreign matter from equipment and renew defaced surfaces.

K. Set and calibrate draft gauges of air filters and other equipment.

L. Inspect fan wheels for clearance and balance. Provide factory-authorized personnel for adjustment where needed.

M. Check each electrical control circuit to verify that operation complies with the Contract Documents.

N. Inspect each pressure gauge, thermometer, and other instruments for calibration. Replace items that are defaced, broken, or that read incorrectly.

O. Repair damaged insulation.

P. Excess Gasses and Fluids:
1. Vent gasses trapped in systems.
2. Verify that liquids are drained from all parts of gas or air systems.

3.3 ATTACHMENTS

A. The attachment listed below, following this Section's "End of Section" designation, is a part of this Specification Section.
1. Supplier's Installation Certification Form (one page).

+ + END OF SECTION + +

SUPPLIER'S INSTALLATION CERTIFICATION

Contract No. and Name: _____

Equipment Specification Section: _____

Equipment Name: _____

Contractor: _____

Manufacturer of Equipment: _____

The undersigned Supplier of the equipment or system described above hereby certifies that Supplier has checked the installation of the equipment or system and that the equipment or system, as specified in the Contract Documents, has been provided in accordance with the manufacturer's recommendations and the Contract Documents, and that the trial operation of the equipment or system has been satisfactory.

Comments: _____

_____ _____

Date Supplier Name (print)

_____

Signature of Supplier

_____ _____

Date Contractor Name (print)

_____

Signature of Contractor

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SECTION 01 78 23

OPERATIONS AND MAINTENANCE DATA

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for manufacturers' operations and maintenance manuals and related data to be furnished by CONTRACTOR.
   2. CONTRACTOR shall submit operation and maintenance data, in accordance with this Section and in accordance with requirements elsewhere in the Contract Documents, as instructional and reference manuals by operations and maintenance personnel at the Site.
   3. Required operation and maintenance data groupings are listed in table(s) in Article 1.2 of this Section. At minimum, submit operation and maintenance data for:
      a. All equipment and systems.
      b. Valves, gates, actuators, and related accessories.
      c. Instrumentation and control devices.
      d. Electrical equipment.
   4. For each operation and maintenance manual, submit the following:
      a. Preliminary Submittal: Printed and bound copy of entire operation and maintenance manual, except for test data, service reports by Supplier, and submit electronic copies.
      b. Final Submittal: Printed and bound copy of complete operations and maintenance manual, including test data and service reports by Supplier, and submit electronic copies.

1.2 SUBMITTALS

A. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Data:
      a. Submit the operations and maintenance data indicated in the Contract Documents, grouped into submittals as indicated in Table 01 78 23-A:

TABLE 01 78 23-A, REQUIRED OPERATIONS AND MAINTENANCE DATA

Name of O&M Manual/Data	For Materials or Equipment Specified in Section(s)
Hot Box Enclosure	22 00 05
Backflow preventer	20 00 05
Sump Pumps	22 13 33
All HVAC Equipment	Application Sections of Division 23
Packaged Engine Generator	26 32 13
Process Valves (each type)	40 05 53
All Instrumentation Equipment	40 60 05

Name of O&M Manual/Data	For Materials or Equipment Specified in Section(s)
Portable Davit Cranes	41 22 23
Centrifugal End Suction Pumps – Dry Pit	43 21 13.12
Stainless Steel Slide Gates	43 26 23
Submersible Mixers	46 41 23

B. Quantity Required and Timing of Submittals:
   1. Preliminary Submittal:
      a. Printed Copies: Two copies, exclusive of copies required by CONTRACTOR.
      b. Electronic Copies: One copy.
      c. Submit to ENGINEER by the earlier of: 90 days following approval of Shop Drawings and product data submittals, or 10 days prior to starting training of operations and maintenance personnel, or 10 days prior to field quality control testing at the Site.
   2. Final Submittal: Furnish final submittal prior to Substantial Completion, unless submittal is specified as required prior to an interim Milestone.
      a. Printed Copies: Three copies.
      b. Electronic Copies: One copy.
      c. All final manufacturer's instructions must be delivered and approved prior to request for payment for 50 percent of the Contract amount.

1.3 FORMAT OF PRINTED COPIES

A. Binding and Cover:
   1. Bind each operation and maintenance manual in durable, permanent, stiff-cover binder(s), comprising one or more volumes per copy as required. Binders shall be not less than one inch wide and maximum of three inches wide. Binders for each copy of each volume shall be identical.
   2. Binders shall be locking three-ring/"D"-ring type, or three-post type. Three-ring binders shall be riveted to back cover and include plastic sheet lifter (page guard) at front of each volume.
   3. Do not overfill binders.
   4. Covers shall be oil-, moisture-, and wear-resistant, including identifying information on cover and spine of each volume.
   5 Provide the following information on cover of each volume:
      a. Title: "OPERATING AND MAINTENANCE INSTRUCTIONS".
      b. Name or type of material or equipment covered in the manual.
      c. Volume number, if more than one volume is required, listed as "Volume __ of __", with appropriate volume-designating numbers filled in.
      d. Name of Project and, if applicable, Contract name and number.
      e. Name of building or structure, as applicable.
   6 Provide the following information on spine of each volume:
      a. Title: "OPERATING AND MAINTENANCE INSTRUCTIONS".
      b. Name or type of material or equipment covered in the manual.
      c. Volume number, if more than one volume is required, listed as "Volume __ of __", with appropriate volume-designating numbers filled in.

d. Project name and building or structure name.

B. Pages:
   1. Print pages in operations and maintenance manual on 30-pound (minimum) paper, 8.5 inches by 11 inches in size.
   2. Reinforce binding holes in each individual sheet with plastic, cloth, or metal. When published, separately-bound booklets or pamphlets are part of the manual, reinforcing of pages within booklet or pamphlet is not required.
   3. Furnish each page with binding margin not less than one inch wide. Punch each page with holes suitable for the associated binding.

C. Drawings:
   1. Bind into the operation and maintenance manual drawings, diagrams, and illustrations up to and including 11 inches by 17 inches in size, with reinforcing specified for pages.
   2. Documents larger than 11 inches by 17 inches shall be folded and inserted into clear plastic pockets bound into the manual. Mark pockets with printed text indicating content and drawing numbers. Include not more than three drawing sheets per pocket.

D. Copy Quality and Document Clarity:
   1. Contents shall be original-quality copies. Documents in the operations and maintenance manual shall be either original manufacturer-printed documents or first-generation photocopies indistinguishable from originals. If original is in color, copies shall be in color. Manuals that contain copies that are unclear, not completely legible, off-center, skewed, or where text or drawings are cut by binding holes, are unacceptable. Pages that contain approval or date stamps, comments, or other markings that cover text or drawing are unacceptable. Faxed copies are unacceptable.
   2. Clearly mark in ink to indicate all components of materials and equipment on catalog pages for ease of identification. In standard or pre-printed documents, indicate options furnished or cross out inapplicable content. Using highlighters to so indicate options furnished is unacceptable.

E. Organization:
   1. Table of Contents:
      a. Provide table of contents in each volume of each operations and maintenance manual.
      b. In table of contents and not less than once in each chapter or section, identify materials and equipment by their functional names. Thereafter, abbreviations and acronyms may be used if their meaning is clearly indicated in a table bound at or near beginning of each volume. Using material or equipment model or catalog designations for identification is unacceptable.
   2. Use dividers and indexed tabs between major categories of information, such as operating instructions, preventive maintenance instructions, and other major subdivisions of data in each manual.

1.4 FORMAT OF ELECTRONIC COPIES

A. Electronic Copies of Operation and Maintenance Manuals:
   1. Each electronic copy shall include all information included in the corresponding printed copy.
   2. Submit each electronic copy on a separate compact disc (CD), unless another electronic data transfer method or format is acceptable to ENGINEER.
   3. File Format:
      a. Files shall be in "portable document format" (PDF). Files shall be electronically searchable.
      b. Submit separate file for each separate document in the printed copy.
      c. Within each file, provide bookmarks for the following:
         1) Each chapter and subsection listed in the corresponding printed copy document's table of contents.
         2) Each figure.
         3) Each table.
         4) Each appendix.
   4. Also submit drawings and figures in one of the following formats: ".bmp", ".tif", ".jpg", or ".gif". When files are submitted on CD, submit such files in a separate directory on the CD.

1.5 CONTENT

A. General:
   1. Prepare each operations and maintenance manual specifically for the Project. Include in each manual all pertinent instructions, as-built drawings as applicable, bills of materials, technical bulletins, installation and handling requirements, maintenance and repair instructions, and other information required for complete, accurate, and comprehensive data for safe and proper operation, maintenance, and repair of materials and equipment furnished for the Project. Include in manuals specific information required in the Specification Section for the material or equipment, data required by Laws and Regulations, and data required by authorities having jurisdiction.
   2. Completeness and Accuracy:
      a. Operation and maintenance manuals that include language stating or implying that the manual's content may be insufficient or stating that the manual's content is not guaranteed to be complete and accurate are unacceptable.
      b. Operations and maintenance manuals shall be complete and accurate.
      c. Operation and maintenance manuals shall indicate the specific alternatives and features furnished, and the specific operation and maintenance provisions for the material or equipment furnished.
   3. Submit complete, detailed written operating instructions for each material or equipment item including: function; operating characteristics; limiting conditions; operating instructions for start-up, normal and emergency conditions; regulation and control; operational troubleshooting; and shutdown. Also

include, as applicable, written descriptions of alarms generated by equipment and proper responses to such alarm conditions.

B. Submit written explanations of safety considerations relating to operation and maintenance procedures.

C. Submit complete, detailed, written preventive maintenance instructions including all information and instructions to keep materials, equipment, and systems properly lubricated, adjusted, and maintained so that materials, equipment, and systems function economically throughout their expected service life. Instructions shall include:
   1. Written explanations with illustrations for each preventive maintenance task such as inspection, adjustment, lubrication, calibration, and cleaning. Include pre-startup checklists for each equipment item and maintenance requirements for long-term shutdowns.
   2. Recommended schedule for each preventive maintenance task.
   3. Lubrication charts indicating recommended types of lubricants, frequency of application or change, and where each lubricant is to be used or applied.
   4. Table of alternative lubricants.
   5. Troubleshooting instructions.
   6. List of required maintenance tools and equipment.

D. Submit complete bills of material or parts lists for materials and equipment furnished. Lists or bills of material may be furnished on a per-drawing or per-equipment assembly basis. Bills of material shall indicate:
   1. Manufacturer's name, address, telephone number, fax number, and Internet website address.
   2. Manufacturer's local service representative's or local parts supplier's name, address, telephone number, fax number, Internet website address, and e-mail addresses, when applicable.
   3. Manufacturer's shop order and serial number(s) for materials, equipment or assembly furnished.
   4. For each part or piece include the following information:
      a. Parts cross-reference number. Cross-reference number shall be used to identify the part on assembly drawings, Shop Drawings, or other type of graphic illustration where the part is clearly shown or indicated.
      b. Part name or description.
      c. Manufacturer's part number.
      d. Quantity of each part used in each assembly.
      e. Current unit price of the part at the time the operations and maintenance manual is submitted. Price list shall be dated.

E. Submit complete instructions for ordering replaceable parts, including reference numbers (such as shop order number or serial number) that will expedite the ordering process.

F. Submit manufacturer's recommended inventory levels for spare parts, extra stock

materials, and consumable supplies for the initial two years of operation. Consumable supplies are items consumed or worn by operation of materials or equipment, and items used in maintaining the operation of material or equipment, including items such as lubricants, seals, reagents, and testing chemicals used for calibrating or operating the equipment. Include estimated delivery times, shelf life limitations, and special storage requirements.

G. Submit manufacturer's installation and operation bulletins, diagrams, schematics, and equipment cutaways. Avoid submitting catalog excerpts unless they are the only document available showing identification or description of particular component of the equipment. Where materials pertain to multiple models or types, mark the literature to indicate specific material or equipment supplied. Marking may be in the form of checking, arrows, or underlining to indicate pertinent information, or by crossing out or other means of obliterating information that does not apply to the materials and equipment furnished.

H. Submit original-quality copies of each approved and accepted Shop Drawing, product data, and other submittal, updated to indicate as-installed condition. Reduced drawings are acceptable only if reduction is to not less than one-half original size and all lines, dimensions, lettering, and text are completely legible on the reduction.

I. Submit complete electrical schematics and wiring diagrams, including complete point-to-point wiring and wiring numbers or colors between all terminal points.

J. Programmable Logic Controllers: If programmable logic controllers are furnished under the Contract:
   1. Submit complete logic listings in (---) format.
   2. Format Requirements:
      a. For ladder diagram logic, include complete cross-referencing of all logic elements. Annotate all elements with clearly understandable tags or descriptive labels.
      a. For function block diagram, label each function block with understandable tags or descriptive labels. Describe purpose and action of each function block.
      a. For sequential function chart, include extensive comments for each step to describe program step function.
      a. For instruction list and structured text, include extensive comments for each program line to describe program line function.
   3. Submit complete programmable logic controller listing of all input/output address assignments, tag assignments, and pre-set constant values, with functional point descriptions.
   4. Submit complete manufacturer's programming manuals.

K. Submit copy of warranty bond and service contract as applicable.

L. When copyrighted material is used in operations and maintenance manuals, obtain

copyright holder's written permission to use such material in the operation and maintenance manual.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 78 36

WARRANTIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This section describes general requirements for warranties required in the various Specifications.
   2. Provisions for the CONTRACTOR's Guarantee of Work period are included in the General Clauses.
   2. This section includes general requirements for:
      a. Suppliers' standard warranties.
      b. Suppliers' special warranties.
      c. Implied warranties.
      d. Commencement and duration of warranties.

1.2 SUBMITTALS

A. General:
   1. For each item of equipment furnished under the Contract, submit Supplier's standard warranty, regardless of whether such warranty or submittal thereof is required by the associated Specifications for that item. Submit such warranties for materials where such submittal is required in the Specifications for the material.
   2. For each item of material or equipment where Supplier's special (or extended) warranty is required by the Contract Documents, submit appropriate special warranty that complies with the Contract Documents.
   3. Supplier's warranties shall be specifically endorsed solely to OWNER by the entity issuing such warranty.
   4. Submit Suppliers' standard warranties and special warranties as submittals in accordance with Schedule of Submittals accepted by ENGINEER.

1.3 SUPPLIERS' WARRANTIES FOR MATERIALS AND EQUIPMENT

A. Warranty Types:
   1. Required by the General Clauses:
      a. Warranties specified for materials and equipment shall be in addition to, and run concurrent with, CONTRACTOR's guarantee of Work and requirements for the Contract's correction period.
      b. Disclaimers and limitations in specific materials and equipment warranties do not limit CONTRACTOR's general warranty and guarantee, nor does such affect or limit CONTRACTOR's performance obligations under the correction period.

2. Material or equipment manufacturer's standard warranty is pre-printed, written warranty published by item's manufacturer and specifically endorsed by manufacturer to OWNER.
3. Special warranty is written warranty that either extends the duration of material or equipment manufacturer's standard warranty or provides other, increased rights to OWNER. Where the Contract Documents indicate specific requirements for warranties that differ from the manufacturer's standard warranty for that item, special warranty is implied.

B. Requirements for Special Warranties:
1. Submit written special warranty document that contains appropriate provisions and identification, ready for execution by material or equipment manufacturer and OWNER. Submit draft warranty with submittals required prior to fabrication and shipment of the item from the Supplier's facility.
2. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed by product manufacturer and other entities as appropriate.
3. Specified Form: When specified forms for special warranties are included in the Contract Documents, prepare written document, properly executed by item manufacturer and OWNER, using the required form.
4. Refer to the Specifications for content and requirements for submitting special warranties.

1.4 IMPLIED WARRANTIES

A. Warranty of Title and Intellectual Property Rights:
1. Except as may be otherwise indicated in the Contract Documents, implied warranty of title required by Laws and Regulations is applicable to the Work and to materials and equipment incorporated therein.
2. Provisions on intellectual property rights, including patent fees and royalties, are in the General Clauses, as may be modified by the Special Clauses.

B. Warranty of Merchantability:
1. Notwithstanding any other provision of the Contract to the contrary, implied warranties of merchantability required by Laws and Regulations apply to the materials and equipment incorporated into the Work.

1.4 COMMENCEMENT AND DURATION OF WARRANTIES

A. Commencement of Warranties:
1. Contract correction period and CONTRACTOR's guarantee of work commence as indicated in the General Clauses.

B. Duration of Warranties:
1. Duration of guarantee of work is in accordance with the General Clauses.
2. Duration of CONTRACTOR's general warranty and guarantee is in accordance with Laws and Regulations.

3. Duration of Suppliers' general warranties is in accordance with the applicable general warranty document accepted by ENGINEER.
4. Duration of required Suppliers' special warranties shall be in accordance with the requirements of the Contract Documents for the subject item.
5. Duration of implied warranties shall be in accordance with Laws and Regulations.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes requirements for Project record documents, to supplement the requirements of the General Clauses.
   2. CONTRACTOR shall provide all labor, materials, equipment, and services to maintain and submit to ENGINEER Project record documents in accordance with the Contract Documents and Article 53, "Record Drawings", of the General Clauses.

B. Maintenance of Record Documents:
   1. Maintain in CONTRACTOR's field office, in clean, dry, legible condition, complete sets of the following record documents: Drawings, Specifications, and Addenda; Shop Drawings, Samples, and other CONTRACTOR submittals, including records of test results, approved or accepted as applicable, by ENGINEER; Change Orders, Work Change Directives, Field Orders, copies of all interpretations and clarifications issued, photographic documentation, survey data, and all other documents pertinent to the Work.
   2. Provide files and racks for proper storage and easy access to record documents. File record documents in accordance with the edition of the Construction Specification Institute's *MasterFormat*™ used for organizing the Project Manual, unless otherwise accepted by ENGINEER.
   3. Promptly make record documents available for observation and review upon request of ENGINEER or OWNER. Requirements for review of record documents status as a condition precedent to progress payments is in Section 01 29 73, Schedule of Values, and Section 01 29 76, Progress Payment Procedures.
   4. Do not use record documents for any purpose other than serving as Project record. Do not remove record documents from CONTRACTOR's field office without ENGINEER's approval.

1.2 SUBMITTALS

A. Closeout Submittals: Submit the following:
   1. Record Documents:
      a. Submit the following Project record documents:
         1) Drawings.
         2) Project Manual including Specifications and Addenda (bound).
      b. Prior to readiness for final payment, submit to ENGINEER one copy of Project's final record documents and obtain ENGINEER's acceptance of

same. Submit complete record documents; do not make partial submittals.

c. Submit both printed record documents and electronic record documents.

d. Submit record documents with transmittal letter on CONTRACTOR letterhead in accordance with requirements in Section 01 33 00, Submittal Procedures.

2. Certifications:

a. Record documents submittal shall include certification, with original signature of official authorized to execute legal agreements on behalf of CONTRACTOR, reading as follows:

"[*Insert Contractor's corporate name*] has maintained and submitted Project record documentation in accordance with the Article 53, "Record Documents" of the General Clauses, Section 01 78 39, Project Record Documents, and other elements of Contract Documents, for the Weaver Street Pumping Station Upgrade. We certify that each record document submitted is complete, accurate, and legible relative to the Work performed under our Contract, and that the record documents comply with the requirements of the Contract Documents.

[*Provide signature, print name, print signing party's corporate title, and date*]"

1.3 RECORDING CHANGES

A. Recording Changes – General:

1. At the start of the Project, label each record document to be submitted as, "PROJECT RECORD" using legible, printed letters. Letters on record copy of the Drawings shall be two inches high.
2. Keep record documents current consistent with the progress of the Work. Make entries on record documents within two working days of receipt of information required to record the change.
3. Do not permanently conceal the Work until required information has been recorded for Project record documents.
4. Accuracy of record documents shall be such that future searches for items shown on the record documents may rely reasonably on information obtained from ENGINEER-accepted record documents.
5. Marking of Entries:
   a. Use erasable, colored pencils (not ink or indelible pencil) for marking changes, revisions, additions, and deletions to record documents.
   b. Clearly describe the change by graphic line and make notations as required. Use straight-edge to mark straight lines. Writing shall be legible and sufficiently dark to allow scanning of record documents into legible electronic files in portable document format (".PDF").
   c. Date each entry on record documents.
   d. Indicate changes by drawing a "cloud" around the change(s) indicated.

e. Mark initial revisions in red. In the event of overlapping changes, use different colors for subsequent changes.

B. Drawings:
1. Record changes on copy of the Drawings. Submittal of CONTRACTOR-originated or -produced drawings as a substitute for recording changes on a copy of the Drawings is unacceptable.
2. Record changes on plans, sections, elevations, schematics, schedules, and details as required for clarity, making reference dimensions and elevations (to Project datum) for complete record documentation.
3. Record actual construction including:
   a. Depths of various elements of foundation relative to Project datum.
   b. Horizontal and vertical location of Underground Facilities referenced to permanent surface improvements and project elevation datum. For each Underground Facility, including pipe fittings, show and indicate dimensions to not less than two permanent, visible surface improvements.
   c. Location of exposed utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure and, where applicable, to Project elevation datum.
   d. Changes in structural and architectural elements of the Work, including changes in reinforcing.
   e. Field changes of dimensions, arrangements, and details.
   f. Changes made in accordance with Addenda, Miscellaneous Additional Work, and Change Orders.
   g. Changes in details on the Drawings. Submit additional details prepared by CONTRACTOR when required to document such changes.
4. Recording Changes for Schematic Layouts:
   a. In some cases on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items are shown schematically and are not intended to portray physical layout. For such cases, the final physical arrangement shall be determined by CONTRACTOR subject to acceptance by ENGINEER.
   b. Record on the Project record documents all revisions to schematics on the Drawings, including: piping schematics, ducting schematics, process and instrumentation diagrams, control and circuitry diagrams, electrical one-line diagrams, motor control center layouts, and other schematics when included in the Drawings. Show and indicate actual locations of equipment, lighting fixtures, in-place grounding system, and other pertinent data.
   c. When dimensioned plans and dimensioned sections or elevations on the Drawings show the Work schematically, indicate on the record documents, by dimensions accurate to within one inch in the field, centerline location of items of Work such as conduit, piping, ducts, and similar items
      1) Clearly identify each item of the Work by accurate notations such as “cast iron drain”, “rigid electrical conduit”, “copper waterline”, and similar descriptions.

2) Show by symbol or by note the vertical location of each item of the Work; for example, “embedded in slab”, “under slab”, “in ceiling plenum”, “exposed”, and similar designations. For piping not embedded, also indicate elevation dimension relative to Project elevation datum.
3) Descriptions shall be sufficiently detailed to be related to the Specifications.

d. ENGINEER may furnish written waiver of requirements relative to schematic layouts shown on plans, sections, and elevations when, in ENGINEER’s judgment, dimensioned layouts of Work shown schematically will serve no useful purpose. Do not rely on such waiver(s) being issued.

5. Supplemental Drawings:
   a. In some cases, drawings produced during construction by ENGINEER or CONTRACTOR supplement the Drawings and shall be included with Project record documents submitted by CONTRACTOR. Supplemental record drawings shall include drawings or sketches that are part of Change Orders, Work Change Directives, and Field Orders and that cannot be incorporated into the Drawings because of space limitations.
   b. Supplemental drawings submitted with record drawings shall be integrated with the Drawings and include necessary cross-references between drawings. Supplemental record drawings shall be on sheets the same size as the Drawings.
   c. When supplemental drawings developed by CONTRACTOR using computer-aided drafting/design (CADD) software are to be included in record drawings, submit electronic files for such drawings in AutoCAD 2018 as part of record drawing submittal. Submit electronic files on compact disc labeled, “Supplemental Record Drawings”, including CONTRACTOR’s name, Project name, and Contract designation.

C. Specifications and Addenda:
   1. Mark each Specifications Section to record:
      a. Manufacturer, trade name, catalog number, and Supplier of each material and equipment item actually provided.
      b. Changes made by Addendum, Miscellaneous Additional Work, and Change Orders.

1.4 ELECTRONIC FILES FURNISHED BY OWNER

A. CADD or Revit files will be furnished by OWNER upon request from the Contractor in accordance with Article 53, “Record Drawings”, of the General Clauses.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 78 43

SPARE PARTS AND EXTRA MATERIALS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. This Section includes administrative and procedural requirements for furnishing spare parts, extra materials, maintenance supplies, and special tools required for maintenance (collectively, "spare parts and extra materials") required by the Contract Documents.
   2. CONTRACTOR shall furnish spare parts, extra materials, and associated information, for materials and equipment furnished in accordance with the Contract Documents. Furnish such items in accordance with the requirements of this Section and the Specifications sections in which such items are indicated.
   3. CONTRACTOR shall be fully responsible for loss and damage to spare parts and extra materials until such items are received by OWNER's facility manager.
   4. Promptly replace spare parts and extra materials furnished by OWNER to CONTRACTOR for use in remedying defective Work.

B. List of Spare Parts and Extra Materials:
   1. With the Shop Drawings and product data submittals for each Specifications section, submit a complete listing of spare parts and extra materials required for maintenance for two years of operation, together with unit prices in current United States funds, and source(s) of supply for each.
   2. Also include listing of spare parts and extra materials, with pricing and sources, in the operations and maintenance data submitted in accordance with Section 01 78 23, Operations and Maintenance Data.

1.2 SUBMITTALS

A. Maintenance Material Submittals: Submit the following:
   1. Spare Parts and Extra Materials:
      a. Furnish to OWNER in accordance with requirements of this Section, and the Specifications section in which the spare parts and extra materials are specified.
   2. Transfer Documentation: For each delivery of spare parts and extra materials, submit to ENGINEER the following:
      a. Submit, on CONTRACTOR's letterhead, a letter of transmittal for spare parts and extra materials furnished under each Specifications section. Letter of transmittal shall accompany spare parts and extra materials. Do not furnish letter of transmittal separate from associated spare parts and extra materials.

b. Furnish three original, identical, signed letters of transmittal for each delivery of spare parts and extra materials furnished under each Specifications section. Upon delivery of specified quantities and types of spare parts and extra materials to OWNER, designated person from OWNER will countersign each original letter of transmittal indicating OWNER's receipt of spare parts and extra materials in the quantity, type, and quality required by the Contract Documents. OWNER will retain one fully-signed original, CONTRACTOR shall submit one fully-signed original to ENGINEER. CONTRACTOR shall retain one fully-signed original for CONTRACTOR's records.

c. Letter of transmittal shall include the following:
   1) Information required for letters of transmittal in Section 01 33 00, Submittal Procedures.
   2) Transmittal shall list spare parts and extra materials furnished under each Specifications Section. List each individual part, material, equipment item, tool, and product and the associated quantity furnished.
   3) Include space for countersignature by OWNER as follows: space for signature, space for printed name, and date.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Packaging and Labeling of Spare Pars and Extra Materials:
   1. Furnish spare parts and extra materials in manufacturer's unopened cartons, boxes, crates, or other original, protective covering suitable for preventing corrosion and deterioration for maximum length of storage normally anticipated by manufacturer.
   2. Packaging of spare parts and extra materials shall be clearly marked and identified with name of manufacturer, applicable material or equipment, part number, part description, and part location in the equipment or system.
   3. Protect and package spare parts and extra materials for maximum shelf life normally anticipated by manufacturer.

B. Storage Prior to Delivery to Owner:
   1. Prior to furnishing spare parts and extra materials to OWNER, store spare parts and extra materials in accordance with the Contract Documents and manufacturers' recommendations.

C. Procedure for Delivery to Owner:
   1. Deliver spare parts and extra materials to OWNER's permanent storage rooms at the Site or area(s) at the Site designated by OWNER.
   2. When spare parts and extra materials are delivered, CONTRACTOR and OWNER will mutually inventory the spare parts and extra materials delivered to verify compliance with the Contract Documents regarding quantity, part numbers, and quality.
   3. Additional procedures for delivering spare parts and extra materials to OWNER, if required, will be developed by ENGINEER and complied with by CONTRACTOR.

4. CONTRACTOR shall reimburse OWNER for all costs and expenses incurred by OWNER, including professional services, for delivery of inadequate, incorrect, or defective spare parts and extra materials. OWNER may withhold such amounts from payments due CONTRACTOR via set-offs in accordance with the Contract Documents.

D. Delivery Time and Eligibility for Payment:
   1. Deliver to OWNER spare parts and extra materials prior to date of Substantial Completion for materials and equipment associated therewith.
   2. Do not deliver spare parts and extra materials before commencing startup for associated material or equipment.
   23. Spare parts and extra materials are not eligible for payment until delivered to OWNER and CONTRACTOR's receipt of OWNER's countersignature on letter of transmittal.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

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SECTION 01 79 23

INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall furnish services of Supplier's operation and maintenance training specialists to instruct OWNER's and facility manager's personnel in recommended operating and maintenance procedures for materials and equipment furnished, in accordance with the Contract Documents.
   2. Supplier shall provide a combination of classroom and field training at the Site, unless otherwise required elsewhere in the Contract Documents.
   3. OWNER or facility manager reserves the right to record training sessions on video for OWNER's later use in instructing OWNER's or facility manager's personnel.

B. Scheduling of Training Sessions:
   1. General:
      a. CONTRACTOR shall coordinate training services with start-up and initial operation of materials and equipment on days and times, and in manner, acceptable to OWNER, in accordance with the Contract Documents.
      b. Training may be required outside of normal business hours to accommodate schedules of operations and maintenance personnel. Furnish training services at the required days and times at no additional cost to OWNER.
   2. Prerequisites to Training:
      a. Training of facility operations and maintenance personnel shall commence after preliminary operation and maintenance data has been submitted and accepted by ENGINEER, and Work required in Section 01 75 11, Checkout and Startup Procedures is complete.
      b. At option of OWNER or ENGINEER, training may be allowed to take place before, during, or after equipment startup.
   3. Training Schedule Submittal:
      a. Training Schedule Required: CONTRACTOR shall prepare and submit proposed training schedule for review and acceptance by ENGINEER and OWNER. Proposed training schedule shall show and indicate all training required in the Contract Documents, and shall demonstrate compliance with specified training requirements relative to number of hours of training for various elements of the Work, number of training sessions, and scheduling.
      b. Timing of Training Schedule Submittal: Submit initial training schedule not less than 60 days before scheduled start of first training session.

Submit final training schedule, incorporating revisions in accordance with ENGINEER's comments, not later than 30 days prior to starting the first training session.

c. OWNER reserved the right to modify personnel availability for training in accordance with process or emergency needs at the facility.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer's Instructors:
      a. Shall be factory-trained by manufacturer of material or equipment.
      b. Manufacturer's instructors shall be proficient and experienced in performing training of the type required.
      c. Instructors shall be proficient in spoken and written English language.
      d. Qualifications of instructors are subject to acceptance by ENGINEER. If ENGINEER does not accept qualifications of proposed instructor, furnish services of replacement instructor with acceptable qualifications.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Training Schedule: Detailed schedule of training sessions, demonstrating compliance with number of training sessions, hours required in the Contract Documents, and complying with the Contract Times. Submit training schedule submittals in accordance with time frames specified in this Section.

B. Informational Submittals: Submit the following:
   1. Lesson Plan: Acceptable lesson plan for training on each material or equipment item, in accordance with Table 01 79 23-A and the Contract Documents. Lesson plan shall comply with requirements of this Section as may be supplemented by Specifications Sections where materials and equipment are specified. Include with lesson plan copy of handouts that will be used during training sessions. Furnish lesson plan submittals in accordance with time frames specified in this Section.
   2. Qualifications:
      a. Credentials of manufacturer's proposed operations and maintenance instructor(s). Credentials shall demonstrate compliance with requirements of this Section and shall include brief resume' and specific details of instructor's operating, maintenance, and training experience relative to the specific material and equipment for which instructor will provide training.

C. Closeout Submittals: Submit the following:
   1. Trainee sign-in sheets for each training session. Submit to OWNER's training coordinator with copy to ENGINEER.

1.4 LESSON PLAN

A. Supplier's lesson plan shall describe specific instruction topics, system components for which training will be furnished, and training procedures. Handouts, if any, to be used in training shall be included with the lesson plan. Describe in lesson plan "hands-on" demonstrations planned for training sessions.

B. Submit acceptable lesson plan not less than 60 days prior to starting associated training.

C. Indicate in lesson plan estimated duration of each training segment.

D. Lesson plan shall include the following:
   1. Material and Equipment Overview (required for all types of operations and maintenance training):
      a. Describe material and equipment's operating (process) function and performance objectives.
      b. Describe material and equipment's fundamental operating principles and dynamics.
      c. Identify equipment's mechanical, electrical, and electronic components and features. Group related components into subsystems and describe function of subsystem and subsystem's interaction with other subsystems.
      d. Identify all support materials and equipment associated with operation of subject equipment, such as air intake filters, valve actuators, motors, and other appurtenant items and equipment.
      e. Identify and describe safety precautions and potential hazards related to operation.
      f. Identify and describe in detail safety and control interlocks.
   2. Operations Personnel Training:
      a. Material and Equipment Overview: As described in Paragraph 1.4.D.1 of this Section.
      b. Operation:
         1) Describe operating principles and practices.
         2) Describe routine operating, startup, and shutdown procedures.
         3) Describe abnormal or emergency startup, operating, and shutdown procedures that may apply.
         4) Describe alarm conditions and responses to alarms.
         5) Describe routine monitoring and recordkeeping procedures.
         6) Describe recommended housekeeping procedures.
      c. Troubleshooting:
         1) Describe how to determine if corrective maintenance or an operating parameter adjustment is required.
   3. Mechanical Maintenance Training:
      a. Material and Equipment Overview: As described in Paragraph 1.4.D.1 of this Section.
      b. Material and Equipment Preventive Maintenance:
         1) Describe preventative maintenance inspection procedures required to:

a) Inspect materials and equipment in operation.
b) Identify potential trouble symptoms and anticipate breakdowns.
c) Forecast maintenance requirements (predictive maintenance).

2) Define recommended preventative maintenance intervals for each component.
3) Describe lubricant and replacement part recommendations and limitations.
4) Describe appropriate cleaning practices and recommend intervals.
5) Identify and describe use of special tools required for maintenance of materials and equipment.
6) Describe component removal, installation, and disassembly and assembly procedures.
7) Perform "hands-on" demonstrations of preventive maintenance procedures.
8) Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
9) Define recommended torquing, mounting, calibrating, and aligning procedures and settings, as appropriate.
10) Describe recommended procedures to check and test equipment following corrective maintenance.

c. Equipment Troubleshooting:
1) Define recommended systematic troubleshooting procedures.
2) Provide component-specific troubleshooting checklists.
3) Describe applicable materials and equipment testing and diagnostic procedures to facilitate troubleshooting.
4) Describe common corrective maintenance procedures with "hands-on" demonstrations.

4. Instrumentation/Controls and Electrical Maintenance Training:
a. Materials and Equipment Overview: As described in Paragraph 1.4.D.1 of this Section.
b. Preventative Maintenance and Troubleshooting of Instrumentation and Control Systems: ENGINEER may grant waiver(s) to allow all training for a given system to be at the location of OWNER's training facility.
c. Preventative Maintenance and Troubleshooting of Other Electrical Systems: In accordance with requirements for Paragraph 1.4.D.3 of this Section.

1.5 TRAINING AIDS

A. Manufacturer's instructor shall incorporate training aids as appropriate to assist in the instruction. Furnish handouts of text, tables, graphs, and illustrations as required. Other appropriate training aids include:
1. Audio-visual aids, such as videos, Microsoft PowerPoint presentations, overhead transparencies, posters, drawings, diagrams, catalog sheets, or other items.
2. Equipment cutaways and samples, such as spare parts and damaged equipment.

3. Tools, such as repair tools, customized tools, and measuring and calibrating instruments.

B. Handouts:
   1. Manufacturer's instructor shall distribute and use descriptive handouts during training. Customized handouts developed especially for training for the Project are encouraged.
   2. Photocopied handouts shall be good quality and completely legible.
   3. Handouts should be coordinated with the instruction, with frequent references made to the handouts.
   4. Provide not less than 15 copies of each handout for each training session.

C. Audio-visual Equipment: Training provider shall provide audio-visual equipment required for training sessions. If suitable equipment is available at the Site, OWNER may make available OWNER's audio-visual equipment; however, do not count on OWNER providing audio-visual equipment. Audio-visual equipment that training provider shall provide, as required, includes:
   1. Laptop computer, presentation software, and suitable projector.
   2. As required, extension cords and spare bulb for projector.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 TRAINING DELIVERY

A. Training Delivery – General:
   1. Instructors shall be fully prepared for the training sessions. Training delivery shall be communicative, clear, and proceed according to lesson plan accepted by ENGINEER, with lesson content appropriate for trainees. If OWNER or ENGINEER deems that training delivery does not to comply with the Contract Documents, training shall be postponed, rescheduled, and re-performed in acceptable manner at no additional cost to OWNER.
   2. Trainee Sign-in Sheets: In format acceptable to OWNER, furnish sign-in sheet for trainees for each session. Sign-in sheets shall include the Project name, equipment or system for which training was furnished, and type of training (e.g., operations, mechanical maintenance, instrumentation/controls maintenance, or other), and name of each trainee. Upon completion of training, submit copy of each sign-in sheet as indicated in Article 1.3 of this Section.

B. "Hands-on" Demonstrations:
   1. Manufacturer's instructor shall present "hands-on" demonstrations of operations and maintenance of materials and equipment for each training session, in accordance with lesson plan accepted by ENGINEER.

2. CONTRACTOR and manufacturer shall furnish tools necessary for demonstrations.

3.2 TRAINING SCHEDULE

A. Manufacturer shall furnish not less than the hours of training and number of sessions indicated in Table 01 79 23-A of this Section. Travel time and expenses are responsibility of manufacturer and are excluded from required training time indicated in the Contract Documents.

TABLE 01 79 23-A, TRAINING SUMMARY TABLE

Material or Equipment	Specification Section	Total Training Time (hours)
Sump Pump	22 13 33	4
All HVAC Equipment	Application Sections Divisions 23	8
Packaged Engine Generator	26 32 14	8
All Instrumentation Equipment	40 60 05	20
Portable Davit Crane	41 22 23	2
Raw Wastewater Pumps	43 21 13.12	8
Slide Gates	43 26 23	4
Submersible Mixers	46 41 23	8
Total	**--**	**62**

+ + END OF SECTION + +

SECTION 02 41 00

DEMOLITION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified and required for demolition, removal, and disposal Work.
   2. The Work under this Section includes, but is not necessarily limited to:
      a. Demolition and removal of existing materials and equipment as shown or indicated in the Contract Documents. The Work includes demolition of structural concrete, walls, structural steel, metals, appurtenances, piping, electrical and mechanical systems and equipment, paving, curbs, sidewalks, gutters, fencing and similar existing facilities.
      b. Demolition and removal of select Underground Facilities underneath, and above-grade piping and utilities in, the building(s) and structures shown or indicated for demolition, unless the Underground Facilities or above-grade facilities are shown or indicated as to remain.
      c. Remove from slabs, foundations, walls, and footings that are to be demolished all utilities and appurtenances embedded in such construction.
   3. Demolitions and removals specified under other Sections shall comply with requirements of this Section.
   4. Perform demolition Work within areas shown or indicated.
   5. Pay all costs associated with transporting and, as applicable, disposing of materials and equipment resulting from demolition.

B. Coordination:
   1. Comply with Section 01 14 16, Coordination with Owner's Operations.
   2. Review procedures under this and other Sections and coordinate the Work that will be performed with or before demolition and removals.

C. Related Sections:
   1. Section 01 74 19, Construction Waste Management and Disposal.
   2. Section 02 83 19, Lead Management

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. Electrical Removals: Entity and personnel performing electrical removals shall be electrician legally qualified to perform electrical construction and electrical work in the jurisdiction where the Site is located.

2. Plumbing Removals: Entity and personnel performing plumbing removals shall be plumber legally qualified to perform plumbing construction and plumbing work in the jurisdiction where the Site is located.

B. Regulatory Requirements:
   1. Demolition, removal, and disposal Work shall be in accordance with 29 CFR 1926.850 through 29 CFR 1926.860 (Subpart T - Demolition), and all other Laws and Regulations.
   2. Comply with requirements of authorities having jurisdiction.

1.3 SUBMITTALS

A. Informational Submittals: Submit the following:
   1. Procedure Submittals:
      a. Demolition and Removal Plan: Not less than ten days prior to starting demolition Work, submit acceptable plan for demolition and removal Work, including:
         1) Plan for coordinating shut-offs, capping, temporary services, and continuing utility services.
         2) Other proposed procedures as applicable.
         3) Equipment proposed for use in demolition operations.
         4) Recycling/disposal facility(ies) proposed, including facility owner, facility name, location, and processes. Include copy of appropriate permits and licenses, and compliance status.
         5) Planned demolition operating sequences.
         6) Detailed schedule of demolition Work in accordance with the accepted Process Schedule.
   2. Notification of Intended Demolition Start: Submit in accordance with Paragraph 3.1.A of this Section.
   3. Qualifications Statements:
      a. Name and qualifications of entity performing electrical removals, including copy of licenses required by authorities having jurisdiction.
      b. Name and qualifications of entity performing plumbing removals, including copy of licenses required by authorities having jurisdiction.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PREPARATION

A. Notification:
   1. At least 48 hours prior to commencing demolition or removal, notify ENGINEER in writing of planned start of demolition Work. Do not start removals without permission of ENGINEER.

B. Protection of Surrounding Areas and Facilities:
   1. Perform demolition and removal Work in manner that prevents damage and injury to property, structures, occupants, the public, and facilities. Do not interfere with use of, and free and safe access to and from, structures and properties.
   2. Closing or obstructing of roads, drives, sidewalks, and passageways adjacent to the Work is not allowed unless indicated otherwise in the Contract Documents. Conduct the Work with minimum interference to vehicular and pedestrian traffic.
   3. Provide temporary barriers, lighting, sidewalk sheds, and other necessary protection.
   4. Repair damage to facilities that are to remain.

C. Existing Utilities: In addition to requirements of the General Conditions, Supplementary Conditions, and Division 01 Specifications, do the following:
   1. Should uncharted or incorrectly charted Underground Facilities be encountered, CONTRACTOR responsibilities shall be in accordance with the General Conditions as may be modified by the Supplementary Conditions. Cooperate with utility owners in keeping adjacent services and facilities in operation.
   2. Sanitary Sewer: Before proceeding with demolition, locate and cap all sewer lines and service laterals discharging from the building or structure being demolished.
   3. Storm Water: Existing storm water system shall remain in place until demolitions of existing building or structure is completed. Upon completing demolition, cut and cap storm sewer laterals at locations shown on the Drawings. Remove existing storm water piping and related structures between points of cutting, and backfill, restore to grade, and stabilize the area over the removed facilities.
   4. Water Piping: Before proceeding with demolition, locate and cap all potable and non-potable waterlines and service laterals serving the building or structure being demolished.
   5. Other Utilities: Before proceeding with demolition, locate and cap as required all other utilities, such as fuel and gas; heating, ventilating, and air conditioning; electric; and communications; and service laterals serving the building or structure being demolished.
   6. Shutdown of utility services shall be coordinated by CONTRACTOR, assisted by OWNER as required relative to contacting utility owners.

D. Remediation:
   1. Perform demolition Work involving lead paint in accordance with Section 02 83 19, Lead Management.

3.2 DEMOLITION – GENERAL

A. Locate construction equipment used for demolition Work and remove demolished materials and equipment to avoid imposing excessive loading on supporting and adjacent walls, floors, framing, facilities, and Underground Facilities.

B. Pollution Controls:
   1. Use water sprinkling, temporary enclosures, and other suitable methods to limit emissions of dust and dirt to lowest practical level. Comply with Section 01 57 05, Temporary Controls, and Laws and Regulations.
   2. Do not use water when water may create hazardous or objectionable conditions such as icing, flooding, or pollution.
   3. Clean adjacent structures, facilities, properties, and improvements of dust, dirt, and debris caused by demolition Work, in accordance with the General Conditions and Section 01 74 05, Cleaning.

C. Comply with Section 01 73 29, Cutting and Patching.
   1. Unless otherwise approved by ENGINEER, proceed with demolition from top of building or structure to the elevation indicated on the Contract Drawings. Complete demolition Work above each floor or tier before disturbing supporting members of lower levels.
   2. Demolish concrete in small sections.
   3. Remove structural framing members and lower to the elevation indicated on the Contract Drawings using hoists, cranes, or other suitable methods. Do not throw or drop to the ground.
   4. Break up and remove foundations and slabs-on-grade unless otherwise shown or indicated as remaining in place.

D. Demolition of Site Improvements:
   1. Pavement, Sidewalks, Curbs, and Gutters: Demolition of asphalt or concrete pavement, sidewalks, curbs, and gutters, as applicable, shall terminate at cut edges. Edges shall be linear and have a vertical cut face.
   2. Fencing, Guardrails, and Bollards: Remove to the limits shown or indicated on the Drawings. Completely remove below-grade posts and concrete.
   3. Manholes, Vaults, Chambers, and Handholes: Remove to the limits shown or indicated on the Drawings.
   4. Underground Facilities Other than Manholes, Vaults, Chambers, and Handholes: Remove to the extent shown or indicated on the Drawings. Unless otherwise shown or indicated, cap ends of piping to remain in place in accordance with the "Mechanical Removals" Article in this Section.

E. Salvage and Ownership:
   1. Refer to Section 01 11 13, Summary of Work, for requirements on salvage, ownership, and handling of equipment and materials removed during demolition and removal Work.
   2. Materials and equipment to remain OWNER's property shall be carefully removed and appropriately handled by CONTRACTOR to avoid damage and invalidation of warranties in effect, and shall be cleaned and stored at the Site (or other site specified in the Contract Documents) at place designated by ENGINEER or OWNER.

F. Finishing of Surfaces Exposed by Removals: Unless otherwise shown or indicated in the Contract Documents, surfaces of walls, floors, ceilings, and other areas exposed

by removals, and that will remain as finished surfaces, shall be repaired and re-finished with materials that match existing adjacent surface, or as otherwise approved by ENGINEER.

3.3 STRUCTURAL REMOVALS

A. Remove structures to lines and grades shown or indicated, unless otherwise directed by ENGINEER. Where limits are not shown or indicated, limits shall be four inches outside item to be installed. Removals beyond limits shown or indicated shall be at CONTRACTOR's expense and such excess removals shall be reconstructed to satisfaction of ENGINEER without additional cost to OWNER.

B. Recycling and Reuse of Demolition Materials:
   1. All concrete, brick, tile, masonry, roofing materials, reinforcing steel, structural metals, miscellaneous metals, plaster, wire mesh, and other items contained in or upon building or structure to be demolished shall be removed, transported, and disposed of away from the Site, unless otherwise approved by ENGINEER.
   2. Do not use demolished materials as fill or backfill adjacent to structures, in pipeline trenches, or as subbase under structures or pavement.

C. After removing concrete and masonry walls or portions thereof, slabs, and similar construction that ties in to the Work or to existing construction, neatly repair the junction point to leave exposed only finished edges and finished surfaces.

D. Where parts of existing structures are to remain in service following demolition, remove the portions shown or indicated for removal, repair damage, and leave the building or structure in proper condition for the intended use.
   1. Remove concrete and masonry to the lines shown or indicated by sawing, drilling, chipping, and other suitable methods. Leave the resulting surfaces true and even, with sharp, straight corners that will result in neat joints with new construction and be satisfactory for the purpose intended.
   2. Do not damage reinforcing bars beyond the area of concrete and masonry removal. Do not saw-cut beyond the area to be removed.
   3. Reinforcing bars that are exposed at surfaces of removed concrete and masonry that will not be covered with new concrete or masonry shall be removed to 1.5 inches below the final surface. Repair the resulting hole, with repair mortar for concrete and grout for masonry, to be flush with the surface.
   4. Where existing reinforcing bars are shown or indicated to extend into new construction, remove existing concrete so that reinforcing bars are clean and undamaged.

E. Where equipment or material anchored to concrete or masonry are removed and anchors are not to be re-used, remove the anchors to not less than 1.5 inches beneath surface of concrete or masonry member. Repair the resulting hole, using repair mortar for concrete and grout for masonry, to be flush with the surface. Alternately, when the anchor is stainless steel, the anchor may be cut flush with the surface of the concrete or masonry, when so approved by ENGINEER.

F. Jambs, sills and heads of windows, passageways, doors, or other openings (as applicable) cut-in to the Work or to existing construction shall be dressed with masonry, concrete, or metal to provide smooth, finished appearance.

G. Where anchoring materials, including bolts, nuts, hangers, welds, and reinforcing steel, are required to attach the Work to existing construction, provide such materials under this Section, unless specified elsewhere in the Contract Documents.

3.4 MECHANICAL REMOVALS

A. Mechanical demolition and removal Work includes dismantling and removing existing piping, ductwork, pumps, equipment, and appurtenances as shown, indicated, and required for completion of the Work. Mechanical removals include cutting and capping as required, except that cutting of existing piping and ductwork to make connections is included under Section 01 14 16, Coordination with Owner's Operations; Section 01 73 29, Cutting and Patching; and applicable Sections of Division 40, Process Integration.

B. Demolition and Removals of Piping, Ductwork, and Similar Items:
   1. Purge piping and tanks (as applicable) of chemicals or fuel (as applicable) and make safe for removal and capping. Remove to the extent shown or indicated existing process, water, waste and vent, chemical, gas, fuel, and other piping. Remove piping to the nearest solid piping support, and provide caps on ends of remaining piping. Where piping to be demolished passes through existing walls to remain, cut off and cap pipe on each side of the wall.
   2. Caps, Closures, Blind Flanges, and Plugs:
      a. Provide closure pieces, such as blind flanges and caps, where shown or required to complete the Work.
      b. Where used in this Section, the term "cap" means the appropriate type closure for the piping or ductwork being closed, including caps, blind flanges, and other closures.
      c. Caps shall be compatible with the piping or ductwork to which the cap is attached, fluid-tight and gastight, and appropriate for the fluid or gas conveyed in the pipe or duct.
      d. Unless otherwise shown or indicated, caps shall be mechanically fastened, fused, or welded to pipe or duct. Plug piping with means other than specified in this Section only when so shown or indicated in the Contractor Documents or when allowed by ENGINEER.
   3. When Underground Facilities are altered or removed, properly cut and cap piping left in place, unless otherwise shown or indicated.
   4. Remove waste and vent piping, and ductwork to extent shown and cap as required. Where demolished vent piping, stacks, and ductwork passes through existing roofing, patch the roof with the same or similar materials. Completed patch shall be watertight and comply with roofing manufacturer's recommendations.
   5. Modifications to potable water piping and other plumbing and heating system work shall comply with Laws and Regulations. All portions of potable water

system that have been modified or opened shall be hydrostatically tested and disinfected in accordance with the Contract Documents, and Laws and Regulations. Hydrostatically test other, normally-pressurized, plumbing piping and heating piping.

C. Equipment Demolition and Removals:
   1. To the extent shown or indicated, remove existing process equipment; pumps; hoisting and conveying equipment; heating, ventilating, and air conditioning equipment; generators; and other equipment.
   2. Where required, disassemble equipment to avoid imposing excessive loading on supporting walls, floors, framing, facilities, and Underground Facilities. Disassemble equipment as required for access through and egress from building or structure. Disassembly shall comply with Laws and Regulations. Provide required means to remove equipment from building or structure.
   3. Remove control panels, operator stations, and instruments associated with equipment being removed, unless shown or indicated otherwise.
   4. Remove fuel appurtenances as applicable, including fuel storage tanks. Dispose of tank contents in accordance with Laws and Regulations.
   5. Remove equipment supports as applicable, anchorages, base, grout, and piping. Remove anchorage systems in accordance with the "Structural Removals" Article in this Section. Remove small-diameter piping back to header unless otherwise indicated.
   6. Remove access platforms, ladders, and stairs related to equipment being removed, unless otherwise shown or indicated.

3.5 ELECTRICAL REMOVALS

A. Electrical demolition Work includes removing existing transformers, distribution switchboards, control panels, motors, starters, conduit and raceways, cabling, poles and overhead cabling, panelboards, lighting fixtures, switches, and miscellaneous electrical equipment, as shown, specified, or required.

B. Remove existing electrical equipment and fixtures to avoid damaging systems to remain, to keep existing systems in operation, and to maintain integrity of grounding systems.

C. Remove or modify motor control centers and switchgear as shown or indicated. Modified openings shall be cut square and dressed smooth to dimensions required for installation of equipment.

D. Disconnect and remove motors, control panels, and other electrical gear where shown or indicated. Motors, microprocessors and electronics, other electrical gear to be reused shall be stored in accordance with Section 01 66 00, Product Storage and Handling Requirements.

E. Cables in conduits to be removed shall be removed back to the power source or control panel, unless otherwise shown or indicated. Verify the function of each cable before disconnecting and removing.

F. Conduits, raceways, and cabling shall be removed where shown or indicated. Abandoned conduits concealed in floor, ceiling slabs, or in walls shall be cut flush with the slab or wall (as applicable) at point of entrance, suitably capped, and the area repaired in a flush, smooth manner acceptable to ENGINEER. Exposed conduits, junction boxes, other electrical appurtenances, and their supports shall be disassembled and removed. Repair all areas of the Work to prevent rusting on exposed surfaces.

G. Conduits in Underground Facilities not scheduled for reuse shall be suitably capped watertight where each enters building or structure to remain.

H. Where shown or indicated, remove direct burial cable. Openings in buildings for entrance of direct burial cable shall be patched with repair mortar or other material approved by ENGINEER for this purpose, and made watertight.

I. Existing poles and overhead cables shall be removed or abandoned as shown and specified. Existing substation(s) and poles owned by electric utility will be removed by the electric utility. Completely remove from the Site poles not owned by electric utility and shown or indicated for removal. Make necessary arrangements with electric utility for removal of utility company's transformers and metering equipment after new electrical system has been installed and energized.

J. Lighting fixtures, wall switches, receptacles, starters, and other miscellaneous electrical equipment, not designated as remaining as OWNER's property, shall be removed and properly disposed off-Site as required.

3.6 DISPOSAL OF DEMOLITION DEBRIS

A. Remove from the Site all debris, waste, rubbish, and material resulting from demolition operations and equipment used in demolition Work. Comply with the General Clauses, Section 01 74 05, Cleaning, and Section 01 74 19, Construction Waste Management and Disposal.

B. Transportation and Disposal:
   1. Non-hazardous Material: Properly transport and dispose of non-hazardous demolition debris at appropriate landfill or other suitable location, in accordance with Laws and Regulations. Non-hazardous material does not contain Asbestos, PCBs, Petroleum, Hazardous Waste, Radioactive Material, or other material designated as hazardous in Laws and Regulations.
   2. Hazardous Material: When handling and disposal of hazardous materials is included in the Work, properly transport and dispose of hazardous materials in accordance with the Contract Documents and Laws and Regulations.

C. Submit to ENGINEER information required in this Section on proposed facility(ies) where demolition material will be recycled. Upon request, ENGINEER or OWNER, shall be allowed to visit recycling facility(ies) to verify adequacy and compliance

status. During such visits, recycling facility operator shall cooperate and assist ENGINEER and OWNER.

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SECTION 02 83 19

LEAD MANAGEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, equipment, tools, materials, and permits required to remove and dispose of lead paint as required to complete the Work.
   2. The extent lead paint abatement is specified.
   3. This Section presents minimum acceptable requirements for construction activities affecting materials, equipment, and structures coated with lead paint. Perform the Work using methods commonly accepted, recognized by OSHA (OSHA (pursuant to 29 CFR 1926.62), and demonstrated to prevent emissions of lead outside of the lead control area when used in accordance with manufacturer's recommendations. Perform the Work to minimize creation of airborne dust and vapors, particularly relative to lead-based paint; minimize the quantity of Hazardous Waste generated; protect the health and safety of personnel at the Site; and, avoid adverse environmental impacts

B. Related Sections
   1. Section 02 41 00, Demolition
   2. Section 09 91 00, Painting.

C. Lead Paint Locations
   1. Exhibit A, Bidwell Environmental, LLC., Hazardous Inventory Report for the Fenimore Road, Weaver Street, Archville and Country Club Lane Pumping Stations, is provided as a reference document for CONTRACTOR to use in recognizing the extent of lead paint to be removed and disposed of under the Contract. This report may not define the extent of all lead material. CONTRACTOR shall use the above report as a guide but shall not hold the OWNER liable for potential omissions and errors.

1.2 REFERENCES

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified.
   1. ANSI Z88.2 - 1980 Respiratory Protection.
   2. 29 CFR 1910 - Occupational Safety and Health Standards.
   3. 29 CFR 1926 - Safety and Health Regulations for Construction.
   4. 40 CFR 50 - National Primary & Secondary Ambient Air Quality Standards.
   5. 40 CFR 60 - Standards of Performance for New Stationary Sources.
   6. 40 CFR 117 - Determination of Reportable Quantities of Hazardous Substances.

7. 40 CFR 171 - Standards for Transportation of Hazardous Materials.
8. 40 CFR 172 - Hazardous Materials Tables and Hazardous Materials Communications Regulations.
10. 40 CFR 173 - General Requirements for Shipments and Packaging.
11. 40 CFR 178 - Shipping Container Specifications.
12. 40 CFR 260 - Hazardous Wastes Management Systems General.
13. 40 CFR 261 - Identification and Listing of Hazardous Waste.
14. 40 CFR 262 - Generators of Hazardous Wastes.
15. 40 CFR 263 - Transporters of Hazardous Wastes.
16. 40 CFR 264/265 - Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.
17. 40 CFR 268 - Land Disposal Restrictions.
18. 40 CFR 302 - Designation, Reportable Quantities and Notification.
19. 40 CFR 745-225 - U.S. Department of Health and Human Services National Institute for Occupational Safety & Health (NIOSH).
20. 40 CFR 745 -Lead; Identification of Dangerous Levels of Lead
21. EPA Method 7082 - Test Methods for Evaluating Solid Wastes.
22. EPA SW-846 - Test Methods for Evaluating Soil Waste Physical/Chemical Methods.
23. EPA Method 3050 Acid Digestion of Sediments, Sludge, and Soils.
24. UL 586 - 1990 High-Efficiency, Particulate, Air Filter Units.
25. NIBS, Guideline Specifications for Reducing Lead-Based Paint Hazards.
26. ASTM D3335 - Test Method for Low Concentration for Lead, Cadmium and Cobalt in Paint by Atomic Absorption Spectroscopy; Compilation of ASTM Standard Guides, Test Methods and Practices on Lead-Based Paint Abatement.
27. SSPC GUIDE 6 (CON) - Guide for Containing Debris Generated During Lead Removal Operations.
28. SSPC GUIDE 7 (DIS) - Guide for the Disposal of Lead-Contaminated Surface Preparation Debris.
29. SSPC SP-11 - Surface Preparation Specification Power Tool Cleaning to Bare Metal.

1.3 DEFINITIONS

A. Abatement: Abatement of lead-containing paint involves demolition of materials and structures coated with lead-containing paint and removal of lead-based paint for structures and materials.

B. Action Level: The Occupational Safety and Health Act (OSHA) Construction Standard 29 CFR 1926.62 defines the action level as the employee exposure, without regard to use of respirators, to airborne concentrations of lead equal to or above 30 micrograms per cubic meter of air (30 μg/m3), 8-hour time-weighted average.

C. Amended Water: Water containing at least one ounce of five percent (5%) trisodium phosphate per gallon of water.

D. Area Monitoring: Air sampling to determine lead concentrations within and outside the lead control area for the purpose of determining compliance with the Action Level.

E. Atomic Absorption Spectroscopy: An analytical method of determining the lead content of a given sample.

F. Physical Boundary: Area physically roped or partitioned off around a lead control area to limit unauthorized entry of personnel. As used in this section, "outside boundary" shall mean the same as "outside lead control area."

G. Certified Industrial Hygienist (CIH): As used in this Section, refers to an Industrial Hygienist employed by CONTRACTOR and certified by the American Board of Industrial Hygiene in comprehensive practice.

H. Change Rooms: Rooms within the designated physical boundary around the lead control area set up to prevent cross-contamination and equipped with separate storage facilities for clean protective work clothing and equipment and for street clothes.

I. Competent Person: Means one who is capable of identifying existing and predictable lead hazards in the surroundings or working conditions and who has authorization to take prompt corrective action to eliminate them.

J. Decontamination Area: Area for removal of contaminated personal protective equipment (PPE).

K. Eight-Hour Time Weighted Average (TWA): Airborne concentration of lead averaged over an 8-hour workday to which an employee is exposed.

L. High Efficiency Particulate Air (HEPA) Filter Equipment: Vacuuming equipment containing a UL 586 HEPA filter system capable of preventing passage of lead contaminated paint dust with an efficiency of 99.97 percent of all particulates greater than 0.3 micron size.

M. Inductively Coupled Plasma Atomic Emission Spectrometry: An analytical laboratory method of determining the lead content of a given sample.

N. Lead - Defined in the OSHA Lead in Construction Standard (29 CFR 1926.62) as metallic Lead, all inorganic Lead compounds, and organic Lead soaps. Excluded from this definition are all other organic Lead compounds.

O. Lead Awareness Training: Training that meets the criteria outlined in the OSHA Lead in Construction Standard (29 CFR 1926.62) for individuals that have the potential to be exposed to Lead-Containing Materials or Lead Wastes. This training shall include discussions of the following: (a) current federal, state, and local regulations pertaining to Lead (including 29 CFR 1926.62) and other heavy metals that may be disturbed during the Work; (b) the health effects of Lead and

other heavy metal exposure; (c) state-of-the-art work practices, engineering controls, and procedures for Abatement, removal, construction/demolition, materials handling, waste management, and housekeeping activities that involve Lead-Containing Materials and Lead Wastes; (d) the use and maintenance of PPE and the use and maintenance of respirators in accordance with 29 CFR 1910.134; (e) medical surveillance programs and the medical removal protection program; (f) requirements regarding warning signs, labeling, and Safety Data Sheets (SDSs) in accordance with 29 CFR 1910.1200; (g) responsibilities of the Competent Person.

P. Lead-Based Paint (LBP): A term used by Department of Housing and Urban Development (HUD) and the EPA to define paint or other surface coatings (e.g., glazes) with Lead levels equal to or exceeding 1.0 milligram per square centimeter (1.0 mg/cm2) or 0.5 % by dry weight. LBP is subject to the requirements set forth in the OSHA Lead in Construction Standard (29 CFR 1926.62).

Q. Lead-Containing Paint (LCP): A term used to define paint or other surface coatings (e.g., glazes) with any detectable amount of Lead less than 1.0 milligram per square centimeter (1.0 mg/cm2) or 0.5 % by dry weight. LCP is subject to the requirements set forth in the OSHA Lead in Construction Standard (29 CFR 1926.62).

R. Lead Paint: A generic term that refers to both LBP and LCP

S. Lead Waste: Miscellaneous waste, dust or debris generated during removal of lead-containing materials, cleanup of a lead control area, or decontamination activities.

T. Lead Control Area: An emission control area to prevent the spread of lead dust, paint chips or debris from projects disturbing lead-containing paint or materials. The lead control area is isolated by physical boundaries to warn unauthorized personnel against entry.

U. Permissible Exposure Limit (PEL): 50 micrograms per cubic meter of air as an 8-hour TWA. If an employee is exposed for more than 8 hours in a workday, the allowable exposure limit shall be calculated by the following formula: allowable exposure limit = 400 micrograms per cubic meter of air/hours worked per day.

V. Personal Monitoring: Personal air sampling, performed within the breathing zone of an employee, by the independent CIH or by a qualified technician under direct supervision at the independent CIH to determine the 8-hour time weighted average concentration in accordance with NIOSH Method 7600. Samples shall be taken on individuals who are representative of each of CONTRACTOR'S job categories.

W. Wipe Sampling: Testing procedures to confirm the effectiveness of controls to prevent the release of lead-containing dust outside the lead control area. Whatman

filters moistened with deionized water shall be used to sample a 1-square foot area.

X. Trigger Activities: Activities that involve the disturbance of lead-containing materials will trigger requirements under the OSHA Lead In Construction standard for conducting personnel exposure assessment sampling, training, medical monitoring, respiratory protection and other requirements as specified in 29 CFR 1926.62. Examples of trigger activities include abrasive blasting, welding, cutting, torch burning, manual demolition of structures, manual scraping, manual sanding, heat gun application, rivet busting, and power tool cleaning.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. CONTRACTOR shall have on staff and assigned to this Project a Lead Paint Abatement Supervisor accredited in the State of New York who will supervise all lead paint activities, and who is a Competent Person, as defined in 29 CFR 1926(b), with a minimum of 2 years experience in lead abatement project work, at least 5 years experience in construction trades, and who has served as a Competent Person on at least three lead projects of comparable scope and methodology to this project. This shall be documented by providing the name of the Competent Person and proof of training to the OWNER.
   2. As applicable for lead removal work, CONTRACTOR/Subcontractor must have a Lead Contractors license in the State of New York and shall have successfully completed at least two abatement projects of comparable scope to this Project within the past 3 years, utilizing the same methods to be employed on this project. This shall be documented by identifying the owner of the facility (including name, address and phone number of owner/project manager), type of facility, volume of material abated, specific tools/technology employed, method of abatement, name of CONTRACTOR and Competent Person supervising work.

B. Regulatory Requirements:
   1. In addition to the detailed requirements of this Specification, CONTRACTOR shall comply with all applicable laws, ordinances, rules, and regulations of federal, state, and local authorities pertaining to removal, handling, storage, transportation, and disposal of lead waste materials. CONTRACTOR shall also comply with the applicable requirements of 29 CFR 1926.62. All matters regarding interpretation of standards shall be submitted in writing to the OWNER for resolution before starting work. Where specifications, requirements, and the referenced documents vary, the most stringent requirement shall apply.
   2. Appropriate Waste Containers: Containers for the storage of all waste shall be DOT-approved and shall be provided by CONTRACTOR.

1.5 SUBMITTALS

A. Informational Submittals: Submit the following:

1. Lead Paint Removal Plan:
    a Submit detailed, Project-specific plan, prepared and signed by the CIH, of work procedures to be used in the removal of lead-containing paint and demolition of materials and equipment coated with lead-based paint. CIH shall also be responsible for oversight of the plan during construction.
    b. Plan shall include a sketch showing the details of the lead control area, location and details of decontamination rooms including showers (if required), change rooms, eating, drinking, smoking, and restroom areas.
    c. Plan shall include interface of trades; sequencing of lead-related work; disposal plan for lead-based paint debris, lead-coated debris, and collected wastewater; proposed respirators and protective equipment; and a detailed description of the method of emissions control that will be used to ensure that airborne lead concentrations of 30 mg/m3 of air are not exceeded inside or outside the lead control area.
2. Hazardous Waste Management Plan: The Hazardous Waste Management Plan shall comply with applicable requirements of federal, state, and local hazardous waste regulations and address:
    a. Identification of hazardous wastes associated with the work as defined in 40 CFR 261.
    b. Estimated quantities of wastes to be generated and disposed of.
    c. Names and qualifications of each vendor that will be transporting, storing, testing, and disposing of the wastes. Include the disposal facility location and a 24-hour phone contact. Furnish copies of EPA, state and local hazardous waste permit applications, permits, and EPA identification numbers prior to start of operations.
    d. Names and qualifications (experience and training) of personnel who will be responsible for on-site management of hazardous wastes prior to start of operations.
    e. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.
    f. Spill prevention, containment, and cleanup contingency measures to be implemented.
    g. Details of on-site hazardous waste storage, removal, and disposal. Hazardous wastes shall be collected and containerized daily. CONTRACTOR shall inspect storage areas weekly, and the inspections documented.
3. Hazard Communication Program: CONTRACTOR shall submit proof of the establishment and implementation of a Hazard Communication Program as required by 29 CFR 1910.1200
4. Equipment and Approach:
    a. Manufacturer's performance warranty and supporting scientific data ensuring that the lead-based paint removal equipment is capable of controlling airborne lead emissions below OSHA's action level (30 mg/m3) as defined in 29 CFR 1926.62 when used in accordance with manufacturer's guidelines.

b. Manufacturers catalog data and certificates of compliance for filters and respirators.
c. Instructions for use of lead-based paint removal systems.
d. Copy of rental equipment notification required under this Section.
e. Equipment Use: Identify the equipment that will be used to apply, remove, collect and containerize the chemical paint stripper and debris and the procedures that will be followed to clean the lead control area, including associated containment structure materials, prior to removal from the Site.
f. Acceptance by ENGINEER or OWNER does imply approval of a particular method or sequence for addressing health, safety, and environmental concerns or to relieve the CONTRACTOR of the responsibility to adequately protect the environment and the health and safety of workers involved in the Project, City employees, agents, and other contractors in adjacent areas, ENGINEER's personnel at the Site, and others at the Site

5. Notification of Start of Lead Paint Removal Work: Five days prior to the proposed start of lead-based paint remediation Work at each separate work area, advise ENGINEER and OWNER in writing of intended start-date for the associated work area.
6. Field Quality Control Submittals:
   a. Reports of visits to Site by CIH.
   b. Report of initial air monitoring results prior to start of lead-based paint remediation Work, and daily air monitoring results and calibration data. Submit within three working days of performing the monitoring. Test results shall be signed by the testing laboratory employee who performed the air monitoring, and the testing laboratory employee that analyzed the sample. Monitoring and testing results shall be accompanied by complete chain-of-custody documentation.
   c. Maintain and submit copy of daily sign in/sign out log indicating each person entering and leaving, by name, employer, date, and time of entry and exit from the lead control area. Only lead-based paint remediation workers, competent persons, CIH, and others directly engaged in the lead-based paint remediation will be allowed in the lead control area.
7. Qualification Statements:
   a. Testing Laboratory Qualifications for Air Samples: Submit the name, address, and telephone number of the testing laboratory selected to perform the analyses of all air monitoring. The testing laboratory shall be accredited by the American Industrial Hygiene Association (AIHA) and be accredited by the Environmental Lead Laboratory Accreditation Program (ELAPP). Provide AIHA and ELAPP documentation along with date of accreditation/ reaccreditation.
   b. Independent CIH: Submit the name of the Independent CIH selected to conduct personnel and area/environmental air sampling, and document evidence that the Independent CIH is currently certified in comprehensive practice by the American Board of Industrial Hygiene, including certification number and date. CONTRACTOR shall submit

certification that the Independent CIH is in no way affiliated with CONTRACTOR. A qualified technician under direct supervision of the Independent CIH may perform Independent CIH tasks specified herein. The Independent CIH shall include a list of tasks to be performed by the technician under the supervision of the Independent CIH and the name and qualifications of technician. The use of an Independent CIH and technician shall not relieve CONTRACTOR of responsibility for ensuring a safe working environment for lead paint removal.

c. Training: For all activities that result in airborne lead concentration equal to, or in excess of the Lead Action Level, or for those activities that take place within a Lead Control Area, CONTRACTOR shall submit for this Contract a sufficient number of properly trained and experienced lead-trained workers each of whom shall (a) be licensed in the State of New Yok, (b) have completed training as a lead worker as per 29 CFR 1926.62 subpart (l); (c) have completed respirator training per 29 CFR 1910.134; (d) have completed initial medical monitoring and have blood lead levels below 35 micrograms per deciliter (μg/dl): if the worker's blood lead level (BLL) is in excess of 35 μg/dl, the worker shall show medical approval for this work.

d. Documentation: Documentation for each employee (as required per federal and State of New York regulations) shall be provided to the OWNER including: (a) dates and proof of licensing in the State of New York, (b) dates and proof of lead training; (c) dates and proof of respirator training and fit testing; (d) dates and proof of initial medical surveillance by CONTRACTOR or other employer in the past year and participation in present employer's ongoing medical surveillance; (e) proof of BLL prior to assignment under 35 μg/dl (if the worker's BLL is in excess of 35 μg/dl, the worker shall show medical approval for this work).

c. CONTRACTOR shall submit a signed notarized statement disclosing all OSHA and EPA citations on lead projects in the past 3 years.

B. Closeout Submittals: Submit the following:

1. Hazardous Waste Disposal Documentation: Completed and signed hazardous waste manifests from treatment or disposal facility shall be provided to the OWNER within 10 days of disposal.

PART 2 – PRODUCTS

2.1 GENERAL EQUIPMENT

A. Respirators: Select respirators approved by the National Institute for Occupational Safety and Health (NIOSH) for use in areas containing lead-contaminated dust and fumes. Provide personnel within the lead control area with adequate and appropriate respiratory protection until the Competent Person establishes the workplace exposure concentration for the specific operation. Once the

concentration has been determined, CONTRACTOR may modify respiratory protection as outlined in 29 CFR 1926.62 and the Lead Control Plan.

B. Special Protective Clothing: Furnish personnel who have a potential to be exposed to lead-contaminated dust or fumes with appropriate disposable protective whole body clothing, head covering, gloves, and foot coverings. Tape sleeves at the wrist and secure foot coverings at the ankles. Furnish appropriate disposable plastic or rubber gloves to protect hands.

C. Rental Equipment Notification: If rental equipment is to be used during lead-containing paint handling and disposal, notify the rental agency in writing concerning the intended use of the equipment. All data demonstrating compliance with the performance requirements of Article 1.4 must be presented to and approved by the ENGINEER prior to use.

D. Filter Certifications: HEPA Filters used in filtered vacuuming equipment must meet or exceed UL 586 requirements and cutting tools manufacturers specifications and recommendations.

2.2 LEAD PAINT REMOVAL EQUIPMENT

A. Use only products and tools complying with requirements presented below:
   1. Use vacuum-assisted power tool system with demonstrated suitability and efficiency in preparing metal surfaces in accordance with SSPC SP-11 and with demonstrated effectiveness in maintaining lead emissions below 30 mg/m3 during abatement operations. Such systems may include dustless needle guns, dustless automatically recirculating wheel blast (rotopeens), and right angle grinders which capture all dust and debris at the cutting tool edge and transport the material under vacuum conditions to an airtight disposal container. Dustless needle guns shall be utilized on metal surfaces only.
   2. System shall allow removal and replacement of collection containers under negative pressure to prevent release of dust during removal and replacement operations. System shall be equipped with feature to automatically shut off in the event of vacuum failure.
   3. Monitor recovery/abrasive action tool at all times using a device capable of determining recovery at the face of each tool and automatically disabling the tool in the event recovery levels are insufficient. As a minimum, monitor shall have the following features: remote warning light, adjustable recovery set point, automatic equipment disabling capabilities, sensing range of zero to five psi, solid-state photohelic instrumentation, and remote sensing at the tool face. Calibrate safe recovery point each day before start up, and each time a new tool or vacuum source is used. Comply with manufacturers' recommendations relative to set-up and use of monitor. Maintain a daily log identifying all calibrations of recovery levels and down time as a result of insufficient recovery levels. Maintain manufacturer's operations and maintenance emanual at the Site.

4. Do not use products containing crystalline silica, and do not introduce non-recoverable materials, and do not use cutting material, that introduces toxic or hazardous materials.
5. Cutting head for use on flat surfaces shall be capable of cutting to within 1.5 inches of inside corners, molding, and edges and may include rotopeen scalers, and dustless needle guns. Tools for corners and moldings shall be specifically designed for such purpose and shall conform to all inside corners, outside corners, curved, flat, and angled surfaces to be abated under this Contract while maintaining vacuum control at the work surface/cutting head interface. Shrouded HEPA vacuum fitted needle guns may be used for non-flat surfaces in accordance with manufacturer recommendations. Vacuum-assisted finishing tools, such as right angle grinders, may be used to achieve SSPC SP-11 compliance but shall not be used for primary removal.
6. Vacuum-assisted power tool systems complying with performance standards indicated in this Section may be used; upon request of ENGINEER submit performance documentation evidencing suitability for intended use.

PART 3 – EXECUTION

3.1 GENERAL

A. Commencement of Work: Five days prior to the proposed start of work at each separate location, CONTRACTOR shall notify the ENGINEER in writing. No work may proceed at each location until authorized by the ENGINEER.

B. CONTRACTOR shall submit any required equipment shutdown plans to the ENGINEER 14 days prior to starting the work.

C. CONTRACTOR shall inform the ENGINEER in writing of proposed access restrictions to other personnel (i.e., areas or items of equipment which will not be accessible during the proposed lead work), giving the estimated time frames and dates of such proposed access restrictions.

D. In the event that ENGINEER personnel must enter the lead control area for reasons unrelated to the supervision or inspection of work under this Contract (under emergency conditions), CONTRACTOR shall stop work and immediately clean-up any loose debris, so as to permit safe entry by ENGINEER personnel. Abatement work shall not proceed until ENGINEER personnel have left the control area.

3.2 PROCESS AND PROCEDURES

A. Protection of Existing Work to Remain: All lead removal work must be conducted without damage to, or contamination of adjacent areas, equipment or surfaces within the Lead Control Area or contamination of existing work or previously cleaned surfaces. CONTRACTOR shall correct all such damage or contamination immediately at CONTRACTOR'S expense.

B. Decontamination: Provide a “decontamination area” within the physical boundary around the designated lead control area. The decontamination area shall include washing facilities for personnel use prior to eating, drinking, or smoking.

C. Hygiene Facilities and Practices: CONTRACTOR shall provide clean change areas for employees engaged in lead work. The change areas shall be equipped with separate storage facilities for protective work clothing and equipment and for street clothes to prevent cross-contamination.
   1. CONTRACTOR shall assure that employees do not leave the immediate work area wearing any protective clothing or equipment that is required to be worn during the work shift.

D. Showers. CONTRACTOR shall provide shower facilities for use by employees whose airborne exposure to lead is above the PEL. When shower facilities are necessary, employees are required to shower at the end of the work shift and CONTRACTOR is required to provide an adequate supply of cleansing agents and towels for use by affected employees.

E. Warning Signs and Labels: Provide conspicuous warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs shall comply with the requirements of 29 CFR 1926.62.
   1. The warning signs shall be posted at each control area and at all approaches to the control area so that employees and/or public may read signs before entry and take necessary protective action.

F. Air Monitoring: Monitoring of airborne concentrations of lead and other toxic metals, as applicable, shall be in accordance with 29 CFR 1926.62 and as specified herein. A CIH or the qualified technician working under the direct supervision of the Independent CIH shall perform air monitoring, testing, and reporting.
   1. Obtain personal air monitoring samples from employees who are anticipated to have the greater risk of exposure as determined by the CIH or Competent Person. In addition, obtain a minimum of two air-monitoring samples outside the lead control area on a daily basis for the duration of the lead work.
   2. Obtain final air monitoring samples when the lead abatement work is complete. The CIH should perform final air sampling before the area is turned back over to OWNER. The results must be less than the action level of 30 μg/m3. Should any of the final samples indicate a higher value, CONTRACTOR shall take appropriate actions to re-clean the area and shall repeat the sampling and analysis at CONTRACTOR'S expense.
   3. Submit results of air monitoring samples to the ENGINEER within 3 days after the air samples are taken, at or within 24 hours from receipt of analytical results, which are in excess of the action level of 30 $\mu g/m^3$.

G. Monitoring Employees: Personal air monitoring shall be carried out during every work shift on at least one employee for each task for the entire shift. Complete documentation on the shift, date, employee hours, hours of abatement work, hours of monitoring and task performed should be provided with each sample and shall accompany the laboratory transmission and be returned by the laboratory with results. The task performed shall be fully described on the sample submission. If the area air monitoring indicates an emission level in excess of 30 $\mu g/m^3$ of air outside the lead control area, lead work shall be stopped. CONTRACTOR shall take immediate corrective action to reduce area emission levels below 30 $\mu g/m^3$ of air, and CONTRACTOR shall clean adjacent areas at no cost to OWNER.

H. After Final Clean-Up (Clearance Examination): Perform a clearance examination (i.e., visual evaluation and sampling) to determine if levels of lead above EPA standards remain following cleaning. After final clean up of the abatement area has been performed, the CIH (or qualified technician under the supervision of the CIH) shall perform a visual evaluation to insure that the control and work area is free of accumulations of dirt, dust or debris. In addition, the examination will include surface wipe sampling and soil sampling (if applicable) to verify that remaining lead levels are below EPA lead hazard standards prior to turning the site over to OWNER. These standards include the following:
   1. 1200 milligrams of lead per kilogram (parts per million) of soil. Should any of the final samples indicate a higher value, CONTRACTOR shall take appropriate actions to re-clean the area and shall repeat the sampling and analysis at CONTRACTOR'S expense.

3.3 CLEANUP AND DISPOSAL

A. Cleanup: Maintain all surfaces, including protective tarps and coverings within the lead control area, free of accumulations of paint chips, dust and debris. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use compressed air to cleanup the area. Perform housekeeping at the end of each shift, and when paint removal operations have been completed, by cleaning the lead control area of visible paint chips using a HEPA-filtered vacuum.

B. Testing of Lead Waste: Test lead waste in accordance with 40 CFR 261 for hazardous waste. Submit a minimum of four randomly collected samples to a certified ELAPP laboratory to determine if it is hazardous waste. Test all samples for the eight toxicity characteristic leaching procedure (TCLP) metals.

C. Collection of Debris: Collect lead-contaminated waste, scrap, debris, bags, containers, equipment, and lead-contaminated clothing, separating waste by type (i.e., contaminated clothing, used containers, drop cloths, and surface materials should be separated).
   1. Do not fill any container or roll-off in excess of the capacity marked on the container. Cover all containers immediately after filling.
   2. Store removed lead waste, lead-contaminated clothing and equipment, dust, and debris in U.S. Department of Transportation (DOT)-approved container

systems. Label each container to identify the waste and the date wastes were first put into the container and ensure that labels remain intact and legible.

3. No water mixed with or contaminated by hazardous or toxic debris may be released into any drain or sewer. CONTRACTOR is advised that discharge of more than 10 pounds of lead into the water within a 24-hour period shall be considered a violation of the Clean Water Act and treated as a reportable quantity in accordance with 40 CFR 117. Such release shall be grounds for immediate termination of this Contract and CONTRACTOR shall be liable for any fines, penalties or remediation costs.
4. Disposal shall be at a site approved by the U.S. Environmental Protection Agency and the State of New York to accept lead waste. Notify the ENGINEER at least 14 days prior to removal of the containers to inspect the containers and the hazardous waste manifest. As necessary, dispose of lead wastes to ensure containers do not remain on the job site longer than 90 calendar days from the initial loading date affixed to the container.
5. Handle, label, store, transport, and dispose of lead or lead-contaminated waste in accordance with 40 CFR 261, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification requirements as required by 40 CFR 268.

D. Non-hazardous Waste: Store non-hazardous waste separate from hazardous wastes. Provide all necessary containers, transportation, and disposal in accordance with federal, state and local regulations.

E. Disposal Documentation: Submit written evidence that the receiving lead waste treatment, storage, or disposal facility (TSD) is approved to accept lead waste by the federal and district or local regulatory agencies. Submit one copy of the complete manifest, signed and dated by the initial transporter in accordance with 40 CFR 262.

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SECTION 03 00 05

CONCRETE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install concrete, reinforcing, and related materials.
   2. The Work includes:
      a. Providing concrete consisting of portland cement, fine and coarse aggregates, water, and approved admixtures; combined, mixed, transported, placed, finished, and cured.
      b. Fabricating and placing reinforcing, including ties and supports.
      c. Design, erection, and removal of formwork.
      d. Building into the concrete all sleeves, frames, anchorage devices, inserts, and other items required to be embedded in concrete.
      e. Providing openings in concrete as required to accommodate Work under this and other Sections.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate installation of items to be installed in the concrete Work.

C. Classifications of Concrete:
   1. Class “A” concrete shall be steel-reinforced and includes all concrete unless otherwise shown or indicated.
   2. Class “B” concrete shall be placed without forms or with simple forms, with little or no reinforcing and includes the following:
      a. Concrete fill.
      b. Duct banks.
      c. Unreinforced encasements.
      d. Curbs and gutters.
      e. Sidewalks.
      f. Thrust blocks.

B. Related Sections:
   1. Section 05 05 33, Anchor Systems.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 224R, Control of Cracking in Concrete Structures.

2. ACI 301, Specifications for Structural Concrete for Buildings.
3. ACI 304R, Guide for Measuring, Mixing, Transporting and Placing Concrete.
4. ACI 305R, Specification for Hot Weather Concreting.
5. ACI 306R, Cold Weather Concreting.
6. ACI 309R, Guide for Consolidation of Concrete.
7. ACI 318, Building Code Requirements for Structural Concrete and Commentary.
8. ACI 347, Guide to Formwork for Concrete.
9. ACI SP-66, ACI Detailing Manual.
10. ASTM A82/A82M, Specification for Steel Wire, Plain, for Concrete Reinforcement.
11. ASTM A185/A185M, Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
12. ASTM A615/A615M, Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
13. ASTM C31/C31M, Practice for Making and Curing Concrete Test Specimens in the Field.
14. ASTM C33/C33M, Specification for Concrete Aggregates.
15. ASTM C39/C39M, Test Method for Compressive Strength of Cylindrical Concrete Specimens.
16. ASTM C42/C42M, Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
17. ASTM C94/C94M, Specification for Ready-Mixed Concrete.
18. ASTM C138/C138M, Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
19. ASTM C143/C143M, Test Method for Slump of Hydraulic-Cement Concrete.
20. ASTM C150/C150M, Specification for Portland Cement.
21. ASTM C172, Practice for Sampling Freshly Mixed Concrete.
22. ASTM C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
23. ASTM C260, Specification for Air-Entraining Admixtures for Concrete.
24. ASTM C309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
25. ASTM C494/C494M, Specification for Chemical Admixtures for Concrete.
26. ASTM C579, Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
27. ASTM C1064/C1064M, Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
28. ASTM D1752, Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
29. ASTM E96/E96M, Test Methods for Water Vapor Transmission of Materials
30. ASTM E154, Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
31. CRD-C 572, U. S. Army Corps of Engineers Specification for Polyvinylchloride Waterstops.
32. CRSI 1MSP, Manual of Standard Practice.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. List of concrete materials and concrete mix designs proposed for use. Include results of tests performed to qualify the materials and to establish the mix designs.
      b. Concrete placement drawings showing the location and type of all joints.
      c. Drawings for fabricating, bending, and placing concrete reinforcing. Comply with ACI SP-66. For walls and masonry construction, provide elevations to a minimum scale of 1/4-inch to one foot. Show bar schedules, stirrup spacing, adhesive dowels, splice lengths, diagrams of bent bars, arrangements, and assemblies, as required for fabricating and placing concrete reinforcing.
   2. Product Data:
      a. Manufacturer's specifications with application and installation instructions for proprietary materials and items, including admixtures and bonding agents.
   3. Samples:
      a. Samples: Submit samples of materials as specified and as otherwise requested by ENGINEER, including names, sources, and descriptions.

B. Informational Submittals: Submit the following:
   1. Site Quality Control Submittals:
      a. Report of testing results for testing of field concrete cylinders for each required time period. Submit within 24 hours after completion of associated test. Test report shall include results of all testing required at time of sampling.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Transportation, Delivery, and Handling:
   1. Deliver concrete reinforcing products to Site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings on approved Shop Drawings.
   2. Materials used for concrete shall be clean and free from foreign matter during transportation and handling, and kept separate until measured and placed into concrete mixer.
   3. Implement suitable measures during hauling, piling, and handling to ensure that segregation of coarse and fine aggregate particles does not occur and grading is not affected.
   4. Deliver grout materials from manufacturers in unopened containers that bear intact manufacturer labeling.
   5. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage:
   1. Store formwork materials above ground on framework or blocking. Cover wood for forms and other accessory materials with protective, waterproof

covering. Provide for adequate air circulation or ventilation under cover.

2. Store concrete reinforcing materials to prevent damage and accumulation of dirt and excessive rust. Store on heavy wood blocking so that reinforcing does not come into contact with the ground. Space framework or blocking supports to prevent excessive deformation of stored materials.
3. Store concrete joint materials on platforms or in enclosures or covered to prevent contact with ground and exposure to weather and direct sunlight.
4. For storage of concrete materials, provide bins or platforms with hard, clean surfaces.
5. Comply with Section 01 66 00, Product Storage and Handling Requirements.

PART 2 – PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland Cement: ASTM C150/C150M, Type II.

B. Aggregates: ASTM C33/C33M.
   1. Fine Aggregate: Clean, sharp, natural sand free of loam, clay, lumps, and other deleterious substances. Dune sand, bank run sand, and manufactured sand are unacceptable.
   2. Coarse Aggregate:
      a. Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter.
      b. Coarse aggregate shall comply with the following:
         1) Crushed stone, processed from natural rock or stone.
         2) Washed gravel, either natural or crushed. Slag, pit gravel, and bank-run gravel are not allowed.
      c. Coarse Aggregate Size: ASTM C33/C33M, Nos. 57 or 67, unless otherwise approved by ENGINEER.

C. Water: Clean, potable.

D. Admixtures:
   1. Air-Entraining Admixture: ASTM C260.
   2. Water-Reducing Admixture: ASTM C494/C494M, Type A.
   3. Water Reducing and Set-Adjusting Admixtures: ASTM C494/C494M, Types D and E.
   4. High Range Water-Reducing Admixture: ASTM C494/C494M, Type F/G.
   5. Use only admixtures that have been tested and approved in the mix designs.
   6. Do not use calcium chloride or admixtures containing chloride ions.

2.2 CONCRETE MIX

A. General:
   1. Normal weight: 145 pounds per cubic foot.

2. Use air-entraining admixture in all concrete. Provide not less than four percent, nor more than eight percent, entrained air for concrete exposed to freezing and thawing, and provide from three to five percent entrained air for other concrete.

B. Proportioning and Design of Class "A" Concrete Mix:
   1. Minimum compressive strength at 28 days: 4,500 psi.
   2. Maximum water-cement ratio by weight: 0.42.
   3. Minimum cement content: 564 pounds per cubic yard.

C. Proportioning and Design of Class "B" Concrete Mix:
   1. Minimum compressive strength at 28 days: 3,000 psi.
   2. Maximum water-cement ratio by weight: 0.50.
   3. Minimum cement content: 517 pounds per cubic yard.

D. Slump Limits:
   1. Proportion and design mixes to result in concrete slump at point of placement of not less than one inch and not more than four inches.
   2. When using high-range water reducers, slump prior to addition of admixture shall not exceed three inches. Slump after adding admixture shall not exceed eight inches at point of placement.

E. Adjustment of Concrete Mixes:
   1. Concrete mix design adjustments may be requested by CONTRACTOR when warranted by characteristics of materials, Site conditions, weather, test results, or other, similar circumstances.
   2. Submit for ENGINEER's approval laboratory test data for adjusted concrete mix designs, including compressive strength test results.
   3. Implement adjusted mix designs only after ENGINEER's approval.
   4. Adjustments to concrete mix designs shall not result in additional costs to OWNER.

2.3 FORM MATERIALS

A. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection. CONTRACTOR shall be responsible for designing the formwork system to resist all applied loads including pressures from fluid concrete and construction loads.

B. Smooth Form Surfaces: Acceptable panel-type to provide continuous, straight, smooth, as-cast surfaces in accordance with ACI 301.

C. Unexposed Concrete Surfaces: Material to suit project conditions.

D. Provide 3/4-inch chamfer at all external corners. Chamfer is not required at re-entrant corners unless otherwise shown or indicated.

E. Form Ties:

1. Provide factory-fabricated, removable, or snap-off metal form ties, that prevent form deflection and prevent spalling of concrete surfaces upon removal. Materials used for tying forms are subject to approval of ENGINEER.
2. Unless otherwise shown or indicated, provide ties so that portion remaining within concrete after removal of exterior parts is at least 1.5 inches from outer surface of concrete. Unless otherwise shown or indicated, provide form ties that, upon removal, will leave a uniform, circular hole not larger than one-inch diameter in the concrete surface.
3. Ties for exterior walls, below-grade walls, and walls subject to hydrostatic pressure shall be provided with waterstops.
4. Wire ties are unacceptable.

2.4 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed bars.

B. Welded Wire Fabric: ASTM A185/A185M.

C. Steel Wire: ASTM A82/A82M.

D. Provide supports for reinforcing including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing in place.
   1. Use wire bar-type supports complying with CRSI MSP1 recommendations, except as specified in this Section. Do not use wood, brick, or other unacceptable materials.
   2. For slabs on grade, use precast concrete blocks, four inches square minimum with compressive strength equal to or greater than the surrounding concrete, or supports with sand plates or horizontal runners where base materials will not support chair legs.
   3. For all concrete surfaces where legs of supports are in contact with forms, provide supports having either hot-dip galvanized, plastic-protected, or stainless steel legs in accordance with CRSI MSP1.
   4. Provide precast concrete supports over waterproof membranes.

E. Adhesive Dowels:
   1. Dowels:
      a. Dowel reinforcing bars shall comply with ASTM A615, Grade 60.
   2. Adhesive:
      a. For requirements for adhesive, refer to Section 05 05 33, Anchor Systems.

2.5 RELATED MATERIALS

A. Waterstops:
   1. PVC Waterstops:
      a. Manufacturers: Provide products of one of the following:
         1) W.R. Meadows, Inc.
         2) Greenstreak Plastic Products Company.

3) Or equal.

b. Waterstops shall comply with CRD-C 572. Do not use reclaimed or scrap material.

c. Minimum Thickness: 3/8-inch.

d. Provide waterstops with minimum of seven ribs equally spaced at each end on each side with the first rib located at the edge. Each rib shall be minimum 1/8-inch in height.

e. Construction Joints: Waterstops shall be six-inch wide flat-strip type.

f. Expansion Joints: Waterstops shall be nine-inch wide centerbulb type.

2. Hydrophilic Waterstops:

a. Products and Manufacturers: Provide one of the following:

1) Duroseal Gasket, by BBZ USA, Inc.

2) Adeka Ultraseal MC-2010M, by Asahi Denka Kogyo K.K.

3) Hydrotite, by Greenstreak Plastic Products Company.

4) Or equal.

b. Hydrophilic waterstop materials shall be bentonite-free and shall expand by minimum of 80 percent of dry volume in the presence of water to form a watertight joint seal without damaging the concrete in which it is cast.

c. Waterstop material shall be composed of resins and polymers that absorb water and cause a completely reversible and repeatable increase in volume.

d. Waterstop material shall be dimensionally stable after repeated wet-dry cycles with no deterioration of swelling potential.

e. Select material in accordance with manufacturer's recommendations for type of liquid to be contained.

f. Minimum cross-sectional dimensions: 3/16-inch by 3/4-inch.

g. Location of hydrophilic waterstops shall be as shown or indicated on the Drawings, or where approved by ENGINEER.

h. Hydrophilic Sealant: Shall adhere firmly to concrete, metal, and PVC in dry or damp condition and be indefinitely elastic when cured.

1) Products and Manufacturers: Provide one of the following:

a) Duroseal Paste, by BBZ USA, Inc.

b) Adeka Ultraseal P-201, by Asahi Denka Kogyo K.K.

c) Hydrotite, by Greenstreak Plastic Products Company.

d) Or equal.

B. Membrane-Forming Curing Compound: ASTM C309, Type I.

C. Epoxy Bonding Agent:

1. Two-component epoxy resin bonding agent.

2. Products and Manufacturers: Provide one of the following:

a. Sikadur 32, Hi-Mod LPL, by Sika Corporation.

b. Eucopoxy LPL, by the Euclid Chemical Company.

c. Or equal.

D. Epoxy-Cement Bonding Agent:

1. Three-component blended epoxy resin-cement bonding agent.

2. Products and Manufacturers: Provide one of the following:

a. Sika Armatec 110 EpoCem, by Sika Corporation.

b. Duralprep A.C., by Euclid Chemical Company.
c. Or equal.

E. Preformed Expansion Joint Filler:
1. Provide preformed expansion joint filler complying with ASTM D1752, Type I (sponge rubber) or Type II (cork).

2.6 GROUT

A. Non-shrink Grout:
1. Pre-packaged, non-metallic, cementitious grout requiring only the addition of water at the Site.
2. Minimum 28-day Compressive Strength: 7,000 psi.
3. Products and Manufacturers: Provide one of the following:
a. NS Grout by Euclid Chemical Company.
b. Set Grout by Master Builders, Inc.
c. NBEC Grout by Five Star Products, Inc.
d. Or equal.

B. Epoxy Grout:
1. Pre-packaged, non-shrink, non-metallic, 100 percent solids, solvent-free, moisture-insensitive, three-component epoxy grouting system.
2. Minimum Seven-day Compressive Strength: 14,000 psi, when tested in accordance with ASTM C579.
3. Products and Manufacturers: Provide one of the following:
a. Euco High Strength Grout, by Euclid Chemical Company.
b. Sikadur 42, Grout Pak, by Sika Corporation.
c. Five Star Epoxy Grout, by Five Star Products, Inc.
d. Or equal.

C. Grout Fill:
1. Grout mix shall consist of cement, fine and coarse aggregates, water, and admixtures complying with requirements specified in this Section for similar materials in concrete.
2. Proportion and mix grout fill as follows:
a. Minimum Cement Content: 564 pounds per cubic yard.
b. Maximum Water-Cement Ratio: 0.45.
c. Maximum Coarse Aggregate size: 1/2-inch, unless otherwise indicated.
d. Minimum 28-day Compressive Strength: 4,000 psi.

PART 3 – EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the substrate and the conditions under which the Work will be performed and notify ENGINEER in writing of unsatisfactory

conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 FORMWORK

A. Construct formwork in accordance with ACI 347 such that concrete members and structures are of correct size, shape, alignment, elevation, and position.

B. Provide openings in formwork to accommodate the Work of other trades. Accurately place and securely support items required to be built into formwork.

C. Clean and adjust forms prior to placing concrete. Apply form release agents or wet forms as required. Re-tighten forms during and after concrete placing, when required, to eliminate cement paste leaks.

D. Removing Formwork:
   1. Comply with ACI 301 and ACI 347, except as otherwise indicated in the Contract Documents.
   2. Do not remove formwork and shoring until supported concrete members have acquired minimum of 90 percent of specified compressive strength. Results of suitable quality control tests of field-cured specimens may be submitted to ENGINEER for review as evidence that concrete has attained sufficient strength for removal of supporting formwork and shoring prior to removal times indicated in the Contract Documents.
   3. Removal time for formwork is subject to ENGINEER's acceptance.
   4. Repair form tie-holes following in accordance with ACI 301.

3.3 REINFORCING, JOINTS, AND EMBEDDED ITEMS

A. Comply with the applicable recommendations of Laws and Regulations and standards referenced in this Section, including CRSI MSP1, for details and methods of placing and supporting reinforcing.

B. Clean reinforcing to remove loose rust and mill scale, earth, ice, and other materials which act to reduce or destroy bond between reinforcing material and concrete.

C. Position, support, and secure reinforcing against displacement during formwork construction and concrete placing. Locate and support reinforcing by means of metal chairs, runners, bolsters, spacers, and hangers, as required.
   1. Place reinforcing to obtain minimum concrete coverages as shown on the Drawings and as required in ACI 318. Arrange, space, and securely tie bars and bar supports together with 16-gage wire to hold reinforcing accurately in position during concrete placing. Set with ties so that twisted ends are directed away from exposed concrete surfaces.
   2. Do not secure reinforcing to formwork using wire, nails or other ferrous metal. Metal supports subject to corrosion shall not be in contact with formed or exposed concrete surfaces.

D. Provide sufficient quantity of supports of strength required to carry reinforcing. Do not place reinforcing more than two inches beyond the last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

E. Splices: Provide standard reinforcing splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements shown or indicated for minimum lap of spliced bars, in accordance with the requirements of ACI SP-66, .

F. Install welded wire fabric in lengths as long as practical, lapping adjoining sections a minimum of one full mesh.

G. Do not place concrete until reinforcing is inspected and ENGINEER indicates that conditions are acceptable for placing concrete. Concrete placed in violation of this paragraph will be rejected. Notify ENGINEER in writing at least two working days prior to proposed concrete placement.

H. Joints:
   1. Provide construction, isolation, expansion, and control joints as indicated or required. Locate construction joints so as to not impair the strength and appearance of the structure. Place isolation and control joints in slabs-on-grade to stabilize differential settlement and random cracking.
   2. In walls, locate joints at a maximum spacing of 40 feet and approximately 12 feet from corners.
   3. In foundation slabs and slabs-on-grade, locate joints at intervals of approximately 40 feet.
   4. In mats and structural slabs and beams, locate joints in compliance with ACI 224R.
   5. Locations of joints shall be in accordance with the Contract Documents and as approved by ENGINEER in the Shop Drawings.
   6. Where construction joints are indicated to be roughened, intentionally roughen surfaces of previously-placed concrete to amplitude of 1/4-inch.

I. Installation of Embedded Items: Set and build into the Work anchorage devices and embedded items required for other Work that is attached to, or supported by, cast-in-place concrete. Use setting diagrams, templates, and instructions provided under other Sections for locating and setting. Refer to Paragraph 1.1.B of this Section. Do not embed in concrete uncoated aluminum items. Where aluminum items are in contact with concrete surfaces, coat aluminum to prevent direct contact with concrete.

J. Adhesive Dowels:
   1. Adhesive dowels shall be reinforcing bar dowels set in an adhesive in hole drilled into hardened concrete. Comply with adhesive system manufacturer's installation instructions regarding hole diameter, drilling method, embedment depth required to fully develop required tensile strength, and hole cleaning and preparation instructions. Unless more-stringent standards are required by adhesive system manufacturer, comply with the following.

2. Drill holes to adhesive system manufacturer's recommended diameter and depth to develop required tensile strength. Holes shall not be more than 1/4-inch greater than nominal bar diameter, and hole depth shall not be less than twelve times nominal bar diameter. Hammer-drill holes. Cored holes are not allowed.
3. Embedment depths shall be based on concrete compressive strength of 2,000 psi when embedded in existing concrete, and 4,000 psi when embedded in new concrete.
4. Determine location of existing reinforcing steel in vicinity of proposed holes prior to drilling. Adjust location of holes to be drilled to avoid drilling through or damaging existing reinforcing bars only when approved by ENGINEER.
5. Before setting adhesive dowel, hole shall be free of dust and debris using method recommended by adhesive system manufacturer. Hole shall be brushed, with manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove dust and loose particles. Hole shall be dry as defined by adhesive system manufacturer.
6. Inject adhesive into hole through injection system mixing nozzle and necessary extension tubes, placed to bottom of hole. Withdraw discharge end as adhesive is placed, but keep end of tube immersed to prevent forming air pockets. Fill hole to depth that ensures that excess material is expelled from hole during dowel placement.
7. Twist dowels during insertion into partially-filled hole to guarantee full wetting of bar surface with adhesive. Insert bar slowly to avoid developing air pockets.

3.4 CONCRETE PLACING

A. Site Mixing: Use drum-type batch machine mixer, mixing not less than 1.5 minutes for one cubic yard or smaller capacity. Increase required mixing time by minimum of 15 seconds for each additional cubic yard or fraction thereof.

B. Ready-Mixed Concrete: Comply with ASTM C94/C94M.

C. Concrete Placing:
   1. Place concrete in a continuous operation within planned joints or sections in accordance with ACI 304R.
   2. Do not begin placing concrete until work of other trades affecting concrete is completed.
   3. Wet concrete and subgrade surfaces to saturated surface dry condition immediately prior to placing concrete.
   4. Deposit concrete as near its final location as practical to avoid segregation due to re-handling or flowing.
   5. Avoid separation of the concrete mixture during transportation and placing. Concrete shall not free-fall for distance greater than four feet during placing.
   6. Complete concrete placing within 90 minutes of addition of water to the dry ingredients.

D. Consolidate placed concrete in accordance with ACI 309R using mechanical vibrating equipment supplemented with hand rodding and tamping, such that

concrete is worked around placing and other embedded items and into all parts of formwork. Insert and withdraw vibrators vertically at uniformly-spaced locations. Do not use vibrators to transport concrete within the formwork. Vibration of formwork or placing is not allowed.

E. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing.
   1. In hot weather comply with ACI 305R.
   2. In cold weather comply with ACI 306R.

3.5 QUALITY OF CONCRETE WORK

A. Make concrete solid, compact, smooth, and free of laitance, cracks, and cold joints.

B. Concrete for liquid-retaining structures and concrete in contact with earth, water, or exposed directly to the elements shall be watertight.

C. Cut out and properly replace to extent directed by ENGINEER, or repair to satisfaction of ENGINEER, surfaces that contain cracks or voids, are unduly rough, or are in defective in any way. Patches or plastering are unacceptable.

D. Repair, removal and replacement of defective concrete directed by ENGINEER shall be at no additional cost to OWNER.

3.6 CURING

A. Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing by using moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until formwork is removed. Provide protection, as required, to prevent damage to exposed concrete surfaces. Total curing period shall not be less than seven days. Curing methods and materials shall be compatible with scheduled finishes.

3.7 FINISHING

A. Slab Finish:
   1. After placing concrete slabs, do not work the surface further until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently. Use a wood float only. Check and level surface plane to a tolerance not exceeding 1/4-inch in ten feet when tested with a ten foot straightedge placed on the surface at not less than two different angles. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, re-float the surface to a uniform, smooth, granular texture. Slab surfaces shall receive a float finish. Provide additional trowel finishing as required in this Section.

2. After floating, begin first trowel finish operation using power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over the surface.
3. Consolidate concrete surface by the final hand troweling operation. Finish shall be free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8-inch in ten feet when tested with a ten-foot straightedge. Grind smooth surface defects that would telegraph through applied floor covering system.
4. Use trowel finish for the following:
    a. Interior exposed slabs, unless otherwise shown or indicated.
    b. Apply non-slip broom finish, after troweling, to exterior concrete slab and elsewhere as shown.

B. Apply chemical floor hardener to exposed interior concrete floor areas when cured and dry, in accordance with hardener manufacturer's instructions.

C. Formed Finish:
1. Provide smooth form concrete finish at exposed surfaces. Use largest practical form panel sizes to minimize form joints. Exposed surfaces include interior water-contacting surfaces of tanks, whether or not directly visible. All surfaces shall be considered as exposed, unless buried or covered with permanent structural or architectural material. After removing forms, patch form tie holes and defects in accordance with ACI 301. Remove fins exceeding 1/8-inch in height. Where surface will be coated or will receive further treatment, remove all fins flush with concrete surface.
2. Provide rough form finish at all unexposed surfaces. After removing forms, patch form tie holes and defects in accordance with ACI 301. Remove fins exceeding 1/2-inch in height.

3.8 GROUT PLACING

A. Place grout as shown and indicated, and in accordance with grout manufacturer's instructions and recommendations. If grout manufacturer's instructions conflict with the Contract Documents, notify ENGINEER and not proceed until obtaining ENGINEER's clarification.

B. Dry-packing is not allowed, unless otherwise indicated.

C. Manufacturers of proprietary grout materials shall make available upon 72 hours notice the services of qualified, full-time, factory-trained employee to aid in ensuring proper use of grout materials at the Site.

D. Placing grout shall comply with temperature and weather limitations described in Article 3.4 of this Section.

3.9 FIELD QUALITY CONTROL

A. Site Testing Services:

1. CONTRACTOR shall employ independent testing laboratory to perform field quality control testing for concrete. ENGINEER will direct where samples are obtained.
2. Testing laboratory will provide all labor, material, and equipment required for sampling and testing concrete, including: scale, glass tray, cones, rods, molds, air tester, thermometer, and other incidentals required.
3. CONTRACTOR shall provide curing and necessary cylinder storage.

B. Quality Control Testing During Construction:
   1. Perform sampling and testing for field quality control during concrete placing, as follows:
      a. Sampling Fresh Concrete: ASTM C172.
      b. Slump: ASTM C143/C143M; one test for each concrete load at point of discharge.
      c. Concrete Temperature: ASTM C1064/C1064M; one for every two concrete loads at point of discharge, and when a change in the concrete is observed. Test each load when time from batching to placement exceeds 75 minutes.
      d. Air Content: ASTM C231; one for every two concrete load at point of discharge, and when a change in the concrete is observed.
      e. Unit Weight: ASTM C138/C138M; one for every two concrete loads at point of discharge, and when a change in the concrete is observed.
      f. Compression Test Specimens:
         1) In accordance with ASTM C31/C31M, make one set of compression cylinders for each 50 cubic yards of concrete, or fraction thereof, of each mix design placed each day. Each set shall be four standard cylinders, unless otherwise directed by ENGINEER.
         2) Cast, store, and cure specimens in accordance with ASTM C31/C31M.
      g. Compressive Strength Tests:
         1) In accordance with ASTM C39/C39M; one specimen tested at seven days, and three specimens tested at 28 days.
         2) Concrete that does not comply with strength requirements will be considered as defective Work.
      h. Within 24 hours of completion of test, testing laboratory will transmit certified copy of test results to CONTRACTOR and ENGINEER.
      i. When there is evidence that strength of in-place concrete does not comply with the Contract Documents, CONTRACTOR shall employ the services of concrete testing laboratory to obtain cores from hardened concrete for compressive strength determination. Cores and tests shall comply with ASTM C42/C42M and the following:
         1) Testing of Adhesive Dowels: OWNER will employ testing agency to perform field quality control testing of drilled dowel installations. After adhesive system manufacturer's recommended curing period and prior to placing connecting reinforcing, proof-test for pullout ten percent of adhesive dowels installed. Adhesive dowels shall be tensioned to 60 percent of specified yield strength. Where dowels are located less than six bar diameters from edge of concrete, ENGINEER will determine tensile load required for test. If one or more dowels

fail, retest all dowels installed for the Work. Dowels that fail shall be reinstalled and retested at CONTRACTOR's expense.

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SECTION 03 01 30

REPAIR AND REHABILITATION OF CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to repair or rehabilitate, as required, all existing concrete shown or indicated in the Contract Documents as being repaired or rehabilitated.
      2. Concrete repair and rehabilitation work shall be identified by the ENGINEER during construction. The ENGINEER shall conduct a one-day, on-site inspection of the existing structure upon removal from service and identify critical areas requiring repair by the CONTRACTOR. The ENGINEER shall provide direction to the CONTRACTOR regarding implementation of repair and rehabilitation. Concrete repair and rehabilitation will be implemented in the existing structure that has been removed from service for work required to install new equipment.
   3. CONTRACTOR shall repair all damage to new concrete construction as specified in this Section except for repair Work specified in Section 03 00 05, Concrete.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the Work that must be installed with or before repair and rehabilitation of concrete.

C. Related Sections:
   1. Section 03 00 05, Concrete.
   2. Section 05 05 33, Anchor Systems.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM C39/C39M, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
   2. ASTM C109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
   3. ASTM C510, Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
   4. ASTM C661, Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.

5. ASTM C793, Standard Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants.
6. ASTM C794, Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
7. ASTM C882/C882M, Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
8. ASTM C920, Standard Specification for Elastomeric Joint Sealants.
9. ASTM D1042, Test Method for Linear Dimensional Changes of Plastics Under Accelerated Service Conditions.
10. ASTM D1752, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
11. ASTM D3574, Test Methods for Flexible Cellular Materials – Slab, Bonded, and Molded Urethane Foams.
12. ASTM G109, Test Method for Determining the Effects of Chemical Admixtures on the Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments.
13. FS TT S 00227E, Interim Federal Specification for Sealing Compound: Elastomeric Type, Multi-Component (For Calking, Sealing, and Glazing in Buildings and Other Structures).
14. ASTM C877, Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data: Information on all products proposed for use, including manufacturer's brochures, technical data, specifications, and other applicable data.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions: Manufacturer's recommended procedures for installing materials proposed for use.
   2. Special Procedure Submittals: When requested by ENGINEER, submit information on methods for supporting during demolition and repair Work existing structures, pipes, and other existing facilities affected by the Work.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling of Materials:
   1. Conform to Section 01 65 00, Product Delivery Requirements, and this Section.
   2. Clearly mark on containers manufacturer's name and label, name or title of material, manufacturer's stock number, and date of manufacture.
   3. Handle materials carefully to prevent inclusion of foreign matter.
   4. Do not open containers or mix components until necessary preparatory Work has been completed and application Work is to start immediately.

B. Storage of Materials:

1. Conform to Section 01 66 00, Product Storage and Handling Requirements, and this Section.
2. Store only approved materials at the Site.

PART 2 – PRODUCTS

2.1 REPAIR MORTAR

A. Product Description: Repair mortar shall be prepackaged, cement-based product specifically formulated for repairing concrete surface defects.

B. Products and Manufacturers: Provide one of the following:
   1. SikaTop 122 Plus, SikaTop 123 Plus, or SikaTop 126 Plus, by Sika Corporation.
   2. DuralTop Gel, DuralTop Flowable Mortar by Euclid Chemical Company.
   3. Or approved equal.

C. Materials:
   1. Provide a two-component, polymer-modified, Portland cement, fast-setting, trowel-grade mortar. Repair mortar shall be enhanced with penetrating corrosion inhibitor, and shall have the following properties:

Physical Property	Value	ASTM Standard
Minimum Compressive Strength at One Day	2,000 psi	C109
Minimum Compressive Strength at 28 Days	6,000 psi	C109
Minimum Bond Strength at 28 Days	1,800 psi	C882*
* Modified for use with repair mortars.		

   2. Where the least dimension of the placement in width or thickness exceeds four inches, extend repair mortar by adding aggregate as recommended by repair mortar manufacturer.

2.2 EXPANSION JOINT REPAIR SYSTEM

A. System Description: Joint repair system shall consist of two components: Preformed Joint Filler and Two component Polyurethane Sealant.

B. Products, Manufacturers, and Materials:
   1. Preformed Joint Filler
      a. Provide preformed expansion joint filler complying with ASTM D 1752, Type I (sponge rubber) or Type II (cork).
   2. Two component Polyurethane Sealant:
      a. Products and Manufacturers: Provide one of the following:
         1) Sikaflex- 2c NS by Sika Corporation.

2) Vulkem 227 by Tremco Sealant/Waterproofing Division of RPM International, Inc.
3) Or approved equal.

b. Polyurethane based, two component elastomeric sealant complying with:
1) FS TTS00227E: Type II (non-sag) Class A and ASTM C920, Type M, Grade NS, Class 25.
2) AdhesioninPeel, FS TTS00227E and ASTM C794: (Minimum five pounds per linear inch with no adhesion failure): 18 lbs.
3) Hardness (Standard Conditions), ASTM C661: 25 (Shore A).
4) Stain and color change, FS TTS00227E and ASTM C510: No discoloration or stain.
5) Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.
6) Rheological Vertical Displacement at 120 degrees F, FS TTS00227E: No sag.
7) VOC Content: 220 grams per liter, maximum

2.3 ANTI-CORROSION COATING REINFORCEMENT PROTECTION

A. Product Description: Anti-corrosion coating shall be a 3 component, solvent free, moisture tolerant, epoxy modified cementitious product formulated for reinforcement protection. Provide two coats at coverage of 40 square feet per gallon per coat.

B. Products and Manufacturers: Provide one of the following:
1. Sika Armatec 110 EpoCem, by Sika Corporation.
2. Or approved equal.

2.4 PROTECTIVE SLURRY MORTAR

A. Product Description: Material shall be two-component, polymer-modified, cementious waterproofing and protective slurry mortar. Provide two coats at coverage of 50 square feet per gallon per coat.

B. Products and Manufacturers: Provide one of the following:
1. Sikatop Seal 107, by Sika Corporation.
2. Or approved equal.

2.5 CRACK INJECTION MATERIALS

A. Structural Crack Repair System:
1. Epoxy for injection shall be low-viscosity, high-modulus moisture insensitive type.
2. Products and Manufacturers: Provide one of the following:
a. Sikadur 35, Hi-Mod L.V. and Sikadur 31, Hi-Mod Gel, by Sika Corporation.
b. Eucopoxy Injection Resin, by Euclid Chemical Company.
c. Or approved equal.

B. Non-structural Crack Repair System:
   1. Hydrophobic Polyurethane Chemical Grout:
      a. Provide hydrophobic polyurethane that forms a flexible gasket.
      b. Products and Manufacturers: Provide one of the following:
         1) SikaFix HH LV, by Sika Chemical Company.
         2) Hydro Active Flex SLV, by De Neef Construction Chemicals, Inc.
         3) Or approved equal.
      c. Shrinkage limit shall not exceed 4.0 percent in accordance with ASTM D1042.
      d. Minimum elongation of 250 percent in accordance with ASTM D3574.
      e. Minimum tensile strength of 150 psi in accordance with ASTM D3574.
   2. Hydrophilic Acrylate-Ester Resin:
      a. Hydrophilic crack repair system shall be acrylate-ester resin that forms a flexible gasket and increase in volume by at least 50 percent when in contact with water.
      b. Products and Manufacturers: Provide one of the following:
         1) Duroseal Multigel 850, manufactured by BBZ USA, Inc.
         2) Superflex AR, by De Neef Construction Chemicals, Inc.
         3) Or approved equal.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which the repair Work is to be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

B. ENGINEER shall inspect each section of the existing structure , mark on site and identify the type of repairs to be performed. CONTRACTOR shall notify the ENGINEER to perform this inspection of the structure:
   1. The structure has been taken out of service.
   2. Lockout tag out has been performed.
   3. The structure has been cleaned and disinfected.
   4. All the existing collector equipment has been demolished and removed as specified.

C. CONTRACTOR shall provide all ladders, scaffolding, and man-lifts to access the drywell and wetwell walls for ENGINEER’s inspection.

3.2 PREPARATION

A. Surface Preparation:

1. Initial Surface Preparation: Remove by chipping, abrasive blasting, or hydro blasting all laitance, foreign material, and unsound concrete from entire area to be repaired. Further roughen surface as specified in this Section. Where non-shrink grout or repair mortar is used, perform additional surface preparation, if any, recommended by product manufacturer.
2. Wetting Procedure: Where repair concrete, shotcrete, or cement grout is used, and bonding agent is not required, or where repair mortar or non-shrink grout manufacturer recommends wet or saturated surface, perform the following:
    a. Continuously apply water for at least four hours to surface being repaired. Where large surface areas are to be repaired, use fog-spray nozzles, mounted on stands, in sufficient number so that entire surface to be repaired is contacted by fog spray cloud.
    b. Prevent concrete from drying until after repair is completed. Re-wet surfaces not yet repaired using water sprays at least a daily; should more than four days elapse without re-wetting surfaces not yet repaired, repeat the original saturating procedure.
    c. Remove standing water in areas to be repaired before placing repair material. Provide means to remove excess water from structure.
3. Preparation for Epoxy Bonding Agent: Where repair material manufacturer recommends use of epoxy-bonding agent, conform to recommendations of both repair material manufacturer and bonding agent manufacturer.

3.3 INSTALLATION, GENERAL

A. Construction Tolerances: Shall be as specified in Section 03 00 05, Concrete, except as specified in this Section and elsewhere in the Contract Documents.

B. Care shall be taken to fully consolidate repair material, completely filling all portions of space to be filled.

C. Bring surface being repaired into alignment with adjacent surfaces, providing uniform, even surface. Surface repaired shall match adjacent existing surfaces in texture and shall receive coatings or surface treatments, if any, provided for the existing surface adjacent to repaired surface.

D. Curing:
    1. Curing of repair mortar and non-shrink grout shall be in accordance with manufacturer's recommendations, except that minimum cure period shall be three days.
    2. Curing of other materials shall be in accordance with requirements of Section 03 00 05, Concrete.

3.4 REPAIR OF SURFACE DEFECTS

A. Surface defects are depressions in a concrete surface that do not extend all the way through the concrete. Surface defects can result from removal of an embedded item, removal of an intersecting concrete member, physical damage, or unrepaired rock pockets created during original placement. For spalls that result

from corroded reinforcing steel or other embedment refer to Article 3.7 of this Section.

B. Preparation: Perform the following in addition to requirements of Article 3.2 of this Section:
   1. Remove by chipping all loose, damaged concrete to sound material.
   2. Where existing reinforcing is exposed, remove concrete to minimum of one-inch around exposed bars. If existing bars are cut through, cracked, or cross sectional area is reduced by more than 25 percent from original, immediately notify ENGINEER.
   3. Score-cut perimeter of area to be repaired to minimum depth of 1/2-inch and maximum depth that will not cut existing reinforcing steel. Chip out existing concrete to the score line so that minimum thickness of repair mortar will be 1/2-inch.

C. Repair Material:
   1. Completely fill the surface defect with specified repair material, in accordance with material manufacturer's instructions and the Contract Documents.
   2. Perform, with repair mortar, repairs of surface defects in concrete normally in contact with water or soil, and interior surfaces of structures that contain water.
   3. Repair of other surface defects may be by applying repair mortar, repair concrete, shotcrete, or cement grout, as appropriate.

3.5 PATCHING OF HOLES IN CONCRETE

A. Fill openings less than 4-in. in their least dimension with repair mortar.

B. Openings greater than four inches and less than 12-in. in their least dimension shall be coated with an epoxy bonding agent prior to filling with repair mortar.

C. Openings greater than 12 inches in their least dimension shall be coated with an epoxy bonding agent prior to filling with Class A concrete in accordance with Section 03 00 05, Concrete.

D. Where repaired holes are in contact with water or soil, provide hydrophilic rubber waterstop within the opening in accordance with Section 03 00 05, Concrete Accessories, prior to filling with repair material.

3.6 REPAIR OF LINED HOLES

A. This Article applies to openings with embedded material over all or a portion of inside surface of hole. Where indicated on the Drawings, remove embedded materials and repair the hole in accordance with Article 3.5 of this Section, as modified in this Article 3.6.

B. Where embedded material is allowed to remain, remove embedded material to at least two inches into the hole, as measured from the plane surface of concrete wall

or slab, as applicable. Embedded material left in place shall be roughened or abraded for proper bonding to repair material. Completely remove substances that interfere with proper bonding.

C. Completely remove embedded items not securely and permanently anchored into concrete.

D. Completely remove embedded items larger than 12 inches in their smallest dimension. In lieu of removing the embedded item, where reinforcing is required as shown or indicated in the Contract Documents, weld reinforcing to embedded item to remain, provided embedded item to remain is composed of metal to which reinforcing steel can be welded.

3.7 REPAIR OF DETERIORATED CONCRETE

A. This Article pertains to deteriorated concrete which has been damaged due to corrosion of reinforcing steel, physical damage due to abrasion, or damage due to chemical attack. Use repair mortar, as specified in this Article, for repairing deteriorated concrete. Where repaired surface will be subsequently covered with plastic liner material, coordinate finishing with requirements for installing plastic liner material.

B. Surface Preparation: In addition to requirements of Article 3.2 of this Section, perform the following surface preparation:
   1. Remove loose, broken, softened, and acid-contaminated concrete by abrasive blasting and chipping to sound, uncontaminated concrete.
   2. Upon completion of removal of deteriorated concrete, notify ENGINEER in writing. Allow two weeks for ENGINEER to evaluate the surface, perform testing for acid contamination if required, determine if additional concrete shall be removed, and to develop special repair details (if any) required. Should ENGINEER determine that additional concrete be removed to reach sound, uncontaminated concrete, allow another two-week period for further evaluation and testing following the additional removal.
   3. Surface preparation shall conform to recommendations of repair mortar manufacturer.
   4. Repair and rehabilitate isolated areas of exposed reinforcing bars in accordance with Article 3.4 of this Section. If extensive areas of reinforcing steel are uncovered after removal of deteriorated concrete, ENGINEER will determine the repair methods required.

C. Repair Mortar Placing:
   1. Conform to manufacturer's recommended procedures for mixing and placing repair mortar.
   2. After initial mixing of repair mortar, addition of water is not allowed.
   3. Minimum Thickness:
      a. Install repair mortar to not less than minimum thickness recommended by manufacturer, and not less than 1/2-inch.
      b. Where removal of deteriorated concrete results in repair thickness of less than minimum required thickness to return to original concrete

surface in isolated areas totaling less than ten percent of total repair surface area, remove additional concrete to obtain at least the required minimum thickness.

c. Where surface area with repair thickness less than minimum required thickness exceeds ten percent of total repair area, notify ENGINEER.

d. Provide repair mortar so that minimum cover over existing reinforcing steel is two inches. Do not place repair mortar creating locally raised areas.

e. Where transitioning to or from wall surfaces not requiring repair, do not feather-out repair mortar at transition. Instead, form the transition by saw cutting a score line to not less than minimum required repair mortar depth and chip out concrete to the saw cut line. Do not cut or otherwise damage reinforcing steel.

4. Place repair mortar to an even, uniform plane to restore concrete member to its original surface. Out-of-plane tolerance shall be such that the gap between 12-inch long straight edge and repair mortar surface does not exceed 1/8-inch, and gap between a four-foot long straight edge and repair mortar surface shall not exceed 1/4-inch. Tolerances specified in this paragraph apply to straight edges placed in any orientation at any location.

D. Finishing:

1. Provide smooth, steel trowel finish to repair mortar.
2. When completed, there shall be no sharp edges. Provide exterior corners, such as at penetrations, one-inch radius. Interior corners shall be square, except corners to receive plastic lining which shall be made with two-inch fillet in repair mortar.

3.8 REPAIR OF EXPANSION JOINTS

A. Surface Preparation: Remove the following from surfaces to be repaired: laitance, foreign material, and unsound concrete. Remove by chipping, abrasive blasting, or hydro blasting. Additional surface preparation, if required, shall be as recommended by expansion joint repair system manufacturer.

B. Installation: Installation shall be as recommended by Joint Filler and Sealant manufacturer.

3.9 REPAIR OF EXPOSED REINFORCING

A. Remove, by abrasive blasting or hydro blasting, all corrosion, foreign materials, and unsound concrete from area to be repaired.

B. Surface shall be visually dry before applying corrosion inhibitor. Liberally apply anti-corrosion coating, 20 mils thickness per coat. Provide two coats. Time between coats shall be the longer of: one hour, or as recommended by manufacturer. Apply using rollers, brushes, or hand-pressure spray equipment.

C. After applying final coat of allow it to dry before corrosion inhibitor or repair mortar is applied.

D. For mortar coating, conform to Paragraphs 3.7.C, 3.7.D, 3.7.E of this Section.

3.10 PROTECTIVE SLURRY MORTAR COATING

A. Remove, by abrasive blasting or hydro blasting, all corrosion, foreign materials, and unsound concrete from area to be repaired.

B. Surface shall be visually dry before applying anti-corrosion coating. Liberally apply anti-corrosion coating, 20 mils thickness per coat. Provide two coats. Time between coats shall be the longer of: two hours, or as recommended by manufacturer. Apply using rollers, brushes, or hand-pressure spray equipment.

C. Apply protective slurry mortar per manufacturer recommendations.

3.11 CRACK INJECTION

A. Examine areas under which injection Work will be installed and locate cracks that require injection. Identify and inject cracks greater than 0.010-inch wide in structures that retain or contain water, wastewater, or similar liquid.

B. Install injection material in accordance with crack injection manufacturer's requirements.

C. After injecting and curing, verify that injected material penetrated the crack adequately and that there is no visible leakage through the crack. After injecting, if crack continues to leak, re-inject crack at no additional cost to OWNER until structure is watertight.

D. If proper penetration of crack cannot be achieved, submit to ENGINEER a proposed alternate approach for modifying the specified injection procedure to properly seal the crack. In new concrete and in concrete cracked as a result of CONTRACTOR's operations, perform modifications to crack injection procedure and fully repair the crack without additional cost to OWNER or extension of the Contract Times.

3.12 SITE QUALITY CONTROL

A. OWNER will employ and pay for services of testing laboratory for Site quality control testing. ENGINEER will direct the number of tests and specimens required, including providing necessary materials for making and facility for storing test specimens. CONTRACTOR shall make standard compression test specimens as specified in this Section under the observation of ENGINEER. CONTRACTOR shall provide:
   1. Necessary assistance required by ENGINEER.
   2. All labor, material, and equipment required, including rods, molds, thermometer, curing in heated storage box, and all other incidentals required, subject to approval by ENGINEER.
   3. All necessary storage, curing, and transportation required for testing.

4. CONTRACTOR will be charged for cost of additional testing and investigation, if any, for Work performed that is not in accordance with the Contract Documents or is otherwise defective.

B. Site Tests of Cement-based Grouts and Repair Mortar:
   1. Obtain compression test specimens during construction from first placement of each type of mortar or grout, and at intervals thereafter as selected by ENGINEER, to verify compliance with the Contract Documents. Specimens will be made by ENGINEER or ENGINEER's representative.
   2. Compression tests and fabrication of specimens for repair mortar and non-shrink grout will be performed in accordance with ASTM C109. Set of three specimens will be made for each test. Tests will be made at seven days, 28 days, and additional time periods as deemed appropriate by ENGINEER.
   3. Bond strength field tests during construction will be performed from first placement of each type of mortar, or grout, and at intervals thereafter selected by ENGINEER, to verify compliance with the Contract Documents.
   4. Bond strength field tests for repair mortar and non-shrink grout will be performed in accordance with ASTM C882 modified for in place construction.
   5. Material, already placed, failing to conform to the Contract Documents, is defective.

C. Repair Concrete: Repair concrete shall be tested as required in Section 03 00 05, Cast-In-Place Concrete.

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SECTION 03 60 00

GROUTING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install grout and perform grouting Work.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before grouting Work.

C. Related Sections:
   1. Section 03 00 05 Concrete

D. Application and Grout Material:
   1. The following is a listing of grouting applications and the corresponding type of grout material to be provided for the associated application. Unless shown or indicated otherwise in the Contract Documents, provide grout in accordance with the following:

TABLE 03 60 00-A, GROUT APPLICATIONS AND MATERIAL TYPES

Application	Required Grout Material Type
Beam and column (one- or two-story height) base plates and precast concrete bearing less than 16 inches in the least dimension	Class II Non-Shrink
Column base plates and precast concrete bearing (greater than two-story height or larger than 16 inches in the least dimension)	Class I Non-Shrink
Base plates for storage tanks and other non-motorized equipment, and motorized equipment or machinery less than 50 horsepower	Class I Non-Shrink (unless otherwise recommended by equipment manufacturer)
Motorized equipment or machinery equal to and greater than 50 horsepower, and motorized equipment or machinery equipment less than 50 horsepower subject to severe shock loads or high vibration	Class III Non-Shrink Epoxy (unless otherwise recommended by equipment manufacturer)
Filling blockout spaces for embedded items	Class II Non-Shrink (Class I where

such as railing posts, guide frames for hydraulic gates, and similar applications	placement time exceeds 15 minutes)
Grout fill or grout toppings less than four inches thick	Grout Fill
Grout fill greater than four inches thick	Class "B" Concrete in accordance with Section 03 00 05, Concrete
Grout for setting filter underdrain blocks, and for filling voids between filter underdrain blocks, and for filling voids between filter underdrain blocks and walls	Filter Underdrain Blocks Grout
Applications not listed above, where grout is indicated on the Drawings	Class I Non-Shrink, unless shown or indicated otherwise

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 211.1, Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
   2. ACI 301, Structural Concrete for Buildings.
   3. ASTM C33/C33M, Specification for Concrete Aggregates.
   4. ASTM C109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
   5. ASTM C230/C230M, Specification for Flow Table for Use in Tests of Hydraulic Cement.
   6. ASTM C531, Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   7. ASTM C579, Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   8. ASTM C827, Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
   9. ASTM C882/C882M, Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.
   10. ASTM C939, Text Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
   11. ASTM C1107/C1107M, Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
   12. ASTM C1181, Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts.
   13. NSF/ANSI 61, Drinking Water System Components - Health Effects.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Grout Testing Laboratory:
      a. Independent testing laboratory employed for design and testing of grout materials and mixes shall comply with testing laboratory requirements in

Section 03 00 05, Concrete and other applicable requirements in the Contract Documents.

2. Manufacturer: Shall have a minimum of five years experience of producing products substantially similar to that required and shall be able to submit documentation of at least five satisfactory installations that have been in successful operation for at least five years each.
3. Manufacturer's Field Service Technician: When required, provide services of manufacturer's full-time employee, factory-trained in handling, use, and installing the products required, with at least five years of experience in field applications of the products required.

B. Trial Batch:
1. Each grout fill and construction joint grout mix proportion and design shall be verified by laboratory trial batch or field experience methods. Comply with ACI 211.1 and submit to ENGINEER a report with the following data:
   a. Complete identification of aggregate source of supply.
   b. Tests of aggregates for compliance with specified requirements.
   c. Scale weight of each aggregate.
   d. Absorbed water in each aggregate.
   e. Brand, type, and composition of cement.
   f. Brand, type, and amount of each admixture.
   g. Amounts of water used in trial mixes.
   h. Proportions of each material per cubic yard.
   i. Unit weight and yield per cubic yard of trial mixtures.
   j. Measured slump.
   k. Measured air content.
   l. Compressive strength developed at seven days and 28 days, from not less than three test specimens cast for each seven-day and 28-day test, and for each design mix.
2. Laboratory Trial Batches: When laboratory trial batches are used to select grout proportions, prepare test specimens and conduct strength tests as specified in ACI 301.
3. Field Experience Method: When field experience methods are used to select grout proportions, establish proportions as specified in ACI 301.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
1. Shop Drawings:
   a. Schedule of Project-specific grout applications, installation locations, and the grout type proposed for each.
   b. List of grout materials and proportions for the proposed mix designs. Include data sheets, test results, certifications, and mill reports to qualify the materials proposed for use in the mix designs. Do not start laboratory trial batch testing until submittal is approved by ENGINEER.
   c. Trial Batch Reports: Submit laboratory test reports for grout materials and mix design tests.
2. Product Data:

a. Data sheets, certifications, and manufacturer's specifications for all materials proposed for use.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions:
      a. Special instructions for shipping, storing, protecting, and handling.
      b. Installation instructions for the materials.

   2. Field Quality Control Submittals:
      a. Report field testing results for each required time period. (e.g., seven-day tests, 28-day tests). Submit within 24 hours after completion of associated test. Each test report shall include results of all testing required at time of sampling.
   3. Supplier Reports:
      a. Submit written report of results of each visit to Site by Supplier's field service technician, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
   4. Qualifications Statements:
      a. Testing laboratory, when not submitted under other Sections.
      b. Manufacturer, when submittal of qualifications is required by ENGINEER.
      c. Manufacturer's field service technician, when submittal of qualifications is required by ENGINEER.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Storage of Materials: Store grout materials in a dry location, protected from weather and protected from moisture.

PART 2 – PRODUCTS

2.1 GENERAL

A. All grout materials, admixtures, cementitious materials, and other materials used in grout that contact potable water or water that will be treated to become potable shall be listed in NSF/ANSI 61.

2.2 NON-SHRINK GROUT MATERIALS

A. General: Non-shrink grout shall be a prepackaged, inorganic, flowable, non-gas-liberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or container in which the materials are packaged. Specific formulation for each type or class of non-shrink grout specified in this Section shall be that recommended by the grout manufacturer for the particular application.

B. Class I Non-Shrink Grout:

1. Class I non-shrink grouts shall have a minimum 28-day compressive strength of 7,000 psi. Use grout for precision grouting and where water-tightness and non-shrink reliability in both plastic and hardened states is critical, in accordance with Table 03 60 00-A in this Section.
2. Products and Manufacturer: Provide one of the following:
    a. Masterflow 928, by Master Builders, Inc.
    b. Five Star Grout, by Five Star Products, Inc.
    c. Hi-Flow Grout, by Euclid Chemical Company.
    d. Or equal.
3. Comply with ASTM C1107/C1107M, Grade C and B (as modified below) when tested using amount of water required to achieve the following properties:
    a. Fluid consistency (20 to 30 seconds) shall be in accordance with ASTM C939.
    b. At temperatures of 45, 73.4, and 95 degrees F.
4. Length change from placing to time of final set shall not have shrinkage greater than the expansion measured at three or fourteen days. Expansion at three or fourteen days shall not exceed the 28-day expansion.
5. Non-shrink property shall not be based on chemically-generated gas or gypsum expansion.
6. Fluid grout shall pass through the flow cone, with continuous flow, one hour after mixing.

C. Class II Non-Shrink Grout:
1. Class II non-shrink grouts shall have minimum 28-day compressive strength of 7,000 psi. Use grout for general-purpose grouting applications in accordance with Table 03 60 00-A in this Section.
2. Products and Manufacturer: Provide one of the following:
    a. Construction Grout, by Master Builders, Inc.
    b. FSP Construction Grout, by Five Star Products, Inc.
    c. NS Grout, by Euclid Chemical Company.
    d. Or equal.
3. Comply with ASTM C1107/C1107M and the following when tested using the quantity of water required to achieve the following properties:
    a. Flowable consistency (140 percent flow in accordance with ASTM C230/C230M, five drops in 30 seconds).
    b. Fluid working time of at least 15 minutes.
    c. Flowable for at least 30 minutes.
4. When tested, grout shall not bleed at maximum allowed water.
5. Non-shrink property shall not be based on chemically-generated gas or gypsum expansion.

D. Class III Non-Shrink Epoxy Grout:
1. Epoxy grout shall be a pourable, non-shrink, 100-percent solids system.
2. Products and Manufacturer: Provide one of the following:
    a. E3G, by Euclid Chemical Company.
    b. Sikadur 42 Grout Pak, by Sika Corporation.
    c. HP Epoxy Grout, by Five Star Products, Inc.

d. Or equal.

3. Epoxy grout system shall have three components: resin, hardener, and specially blended aggregate, all pre-measured and prepackaged. Resin component shall not contain non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are unacceptable. Variation of component ratios is not allowed without specific recommendation by manufacturer. Manufacturer's instructions shall be printed on each container in which products are packaged.
4. The following properties shall be attained with the minimum quantity of aggregate allowed by epoxy grout manufacturer.
    a. Vertical volume change at all times before hardening shall be between zero percent shrinkage and 4.0 percent expansion when measured in accordance with ASTM C827 (modified for epoxy grouts by using an indicator ball with specific gravity between 0.9 and 1.1).
    b. Length change after hardening shall be less than 0.0006-inch per inch and coefficient of thermal expansion shall be less than 0.00003-inch per inch per degree F when tested in accordance with ASTM C531.
    c. Compressive creep at one year shall be less than 0.001-inch per inch when tested under a 400-psi constant load at 140 degrees F in accordance with ASTM C1181.
    d. Minimum seven-day compressive strength shall be 14,000 psi when tested in accordance with ASTM C579
    e. Grout shall be capable of maintaining at least a flowable consistency for minimum of 30 minutes at 70 degrees F.
    f. Shear bond strength to portland cement concrete shall be greater than shear strength of concrete when tested in accordance with ASTM C882/C882M.
    g. Minimum effective bearing area shall be 95 percent.

2.3 GROUT MATERIALS OTHER THAN NON-SHRINK GROUT

A. General: Materials for grouts (other than non-shrink grouts) shall be in accordance with Section 03 00 05, Concrete, except as otherwise specified in this Section.

B. Grout Fill:
1. Grout fill shall be comprised of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and mixed in accordance with this Section.
    a. Minimum Compressive Strength: 4,000 psi at 28 days.
    b. Maximum Water-Cement Ratio: 0.45 by weight.
    c. Coarse Aggregate: ASTM C33/C33M, No. 8 size.
    d. Fine Aggregate: ASTM C33/C33M, approximately 60 percent by weight of total aggregate.
    e. Air Content: Seven percent (plus or minus one percent).
    f. Minimum Cement Content: 564 pounds per cubic yard.
    g. Slump for grout fill shall be adjusted to match placing and finishing conditions, and shall not exceed four inches.

C. Construction Joint Grout:
   1. Construction joint grout shall be comprised of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned with similar cementitious characteristics as Class "A" concrete specified in Section 03 00 05, COncrete. Mix design shall result in grout that is flowable with high mortar content. Mix requirements are:
      a. Minimum Compressive Strength: 4,500 psi at 28 days.
      b. Maximum Water-Cement Ratio: 0.42 by weight.
      c. Coarse Aggregate: ASTM C33/C33M, No. 8 size.
      d. Fine Aggregate: ASTM C33/C33M, approximately 60 percent by weight of total aggregate.
      e. Air Content: Seven percent (plus or minus one percent).
      f. Minimum Cement Content: 752 pounds per cubic yard.
      g. Slump for Construction Joint Grout: Seven inches (plus or minute one inch).

D. Filter Underdrain Blocks Grout:
   1. Grout shall comply with Article 2.1 of this Section. Grout shall consist of one part cement to two parts sand with shrinkage-reducing admixture. Class I or Class II non-shrink grout may be used in lieu of filter underdrain blocks grout.
      a. Minimum Compressive Strength: 4,000 psi at 28 days.
      b. Maximum Water-Cement Ratio: 0.45 by weight.

2.4 CURING MATERIALS

A. Curing materials shall comply with Section 03 05 00, Concrete, and shall be as recommended by the manufacturer of prepackaged grouts.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine substrate and conditions under which grouting will be performed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
   1. Place grout as shown and indicated, and in accordance with Laws and Regulations and grout manufacturer's instructions. If manufacturer's instructions conflict with the Contract Documents, obtain clarification or interpretation from ENGINEER before proceeding.
   2. Consistency of non-shrink grouts shall be as required to completely fill the space to be grouted for the particular application. Do not install grout for dry-packing without approval of ENGINEER. When dry-packing is approved by ENGINEER, dry-pack consistency shall be such that grout has sufficient water

to ensure hydration and grout strength development, and remains plastic, moldable, and that does not flow.

3. Grouting shall comply with temperature and weather limitations in Section 03 00 05, Concrete.
4. Cure grout in accordance with grout manufacturer's instructions for prepackaged grout and Section 03 00 05, Concrete, for grout fill.

B. Columns and Beams:
   1. After shimming columns and beams to proper elevation, securely tighten anchors. Properly form around base plates allowing sufficient room around edges for placing grout. Provide adequate depth between bottom of base plate and top of concrete base to assure that void is completely filled with non-shrink grout.

C. Equipment Bases:
   1. Install equipment in accordance to manufacturer's recommendations, Laws, and Regulations, and the Contract Documents. After shimming equipment to proper elevation, securely tighten anchors. Properly form around base plates, allowing sufficient room around edges for placing grout. Provide adequate depth between bottom of equipment base and top of concrete base to ensure that voids are completely filled with non-shrink grout.

D. Handrail Posts:
   1. After posts have been properly inserted into holes or sleeves, fill annular space between posts and sleeve with non-shrink grout. Bevel grout at juncture with post so that water will flow away from post.

D. Construction Joints:
   1. Place a six-inch minimum thick layer of construction joint grout over contact surface of concrete at interface of horizontal construction joints in accordance with Section 03 00 05, Concrete.

E. Grout Fill:
   1. All mechanical, electrical, and finish work shall be completed prior to placing grout fill. Base slab shall be provided with a scratched finish in accordance with Section 03 00 05, Concrete. Roughen existing slabs shall by abrasive blasting or hydroblasting exposing aggregates to ensure bonding to base slab.
   2. Minimum thickness of grout fill shall be one-inch. Where finished surface of grout fill is to form an intersecting angle of less than 45 degrees with concrete surface against which grout will be placed, form a key in the concrete surface at the intersection point. Key shall be minimum of 3.5 inches wide by 1.5 inches deep.
   3. Thoroughly clean and wet base slab prior to placing grout fill. Do not place grout fill until slab is completely free of standing water. A thin coat of neat Type II cement slurry shall be broomed into surface of slab. Place grout fill while slurry is wet. Grout fill shall be compacted by rolling or tamping, brought to elevation, and floated. In tanks and basins where scraping-type equipment will be installed, grout fill shall be screeded by blades attached to

revolving mechanism of equipment in accordance with procedures recommended by equipment manufacturer after grout is brought to elevation.

4. Grout fill placed on sloping slabs shall be installed uniformly from bottom of slab to top, for full width of placement.
5. Test grout fill surface with a straight edge to detect high and low spots; immediately correct high and low spots in grout fill. When grout fill has hardened sufficiently, grout fill shall be steel troweled to provide a smooth surface free of bug holes and other imperfections. While an acceptable type of mechanical trowel may be used in this operation, the last pass over the grout fill surface shall be by hand-troweling. During finishing, do not apply the following to the grout fill surface: water, dry cement, or mixture of dry cement and sand.
6. Cure and protect grout fill in accordance with Section 03 00 05, Concrete .

3.3 FIELD QUALITY CONTROL

A. Field Testing Services:
   1. CONTRACTOR shall employ an independent testing laboratory to perform field quality control testing for grout. ENGINEER will direct where samples are to be obtained.
   2. CONTRACTOR shall provide all curing and necessary cube storage as specified in Section 01 45 28, On-Site Facilities for Testing Laboratory.
   3. Comply with testing laboratory requirements in Section 03 00 05, Concrete for required testing laboratory qualifications.

B. Quality Control Testing During Construction:
   1. Grout Fill: Perform sampling and testing for field quality control during grout fill placing as follows:
      a. Sampling Fresh Grout Fill: ASTM C172.
      b. Slump: ASTM C143; one test for each load of grout at point of discharge.
      c. Air Content: ASTM C231; one sample for every two grout loads at point of discharge, and when a change in the grout is observed.
      e. Compression Test Specimens:
         1) In accordance with ASTM C109/C109M; make one set of compression cubes for each 50 cubic yards of grout, or fraction thereof, of each mix design placed each day. Each set shall be four standard cubes, unless otherwise directed by ENGINEER.
   2. Non-shrink Grout: Perform sampling and testing for field quality control during non-shrink grout placing as follows:
      a. Perform compression testing of non-shrink grout in accordance to ASTM C109/C109M at intervals during construction as selected by ENGINEER. Make a set of four specimens for testing compressive strength at a period of time selected by the ENGINEER.
      b. Perform compression tests on epoxy grout and fabricate specimens for epoxy grout testing in accordance with ASTM C579, Method B, at intervals during construction as selected by the ENGINEER. Make a set of four specimens for testing compressive strength at a period of time selected by ENGINEER.

C. Evaluation of Field Quality Control Tests:
   1. Do not use grout, delivered to final point of placement, having slump or total air content that does not comply with the Contract Documents.
   2. Compressive strength tests for laboratory-cured cubes will be acceptable if averages of all sets of three consecutive compressive strength test results equal or exceed the required 28-day design compressive strength of the associated type of grout.
   3. If the compressive strength tests do not comply with the requirements in the Contract Documents, the grout represented by such tests will be considered defective and shall be removed and replaced, or subject to other action required by ENGINEER, at CONTRACTOR's expense.

D. Manufacturer's Services:
   1. Manufacturers of proprietary materials shall make available upon 72 hours notification the services of qualified, full time employee, experienced in serving as a field service technician for the products required, to aid in assuring proper use of products under the actual conditions at the Site.

+ + END OF SECTION + +

SECTION 04 00 05

MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide labor, materials, equipment, and incidentals as shown, specified and required for masonry Work, including:
      a. Providing openings in unit masonry construction to accommodate the Work under this and other Specification Sections, and building into unit masonry construction all items such as sleeves, anchorage devices, inserts and other items to be embedded in unit masonry construction for which placement is not specifically provided under other Specification Sections.
   2. Extent of each type of unit masonry is shown.
   3. Types of products and features required include:
      a. Concrete unit masonry.
      b. Brick masonry.
      c. Masonry mortar and grout.
      d. Masonry accessories.
      f. Unit masonry meeting requirements of Special Inspections.

B. Coordination:
   1. Review installation procedures under other Specification Sections and coordinate the items that must be installed with unit masonry construction Work.
   2. Unit masonry construction done without built-in flashings and other built-in Work shall be removed and rebuilt at no additional cost to OWNER, even if discovered after apparent completion of unit masonry construction.
   3. Coordinate Work under other Specification Sections to avoid delay of masonry construction.

C. Related Sections:
   1. Section 07 11 13, Bituminous Dampproofing.
   2. Section 07 21 05, Building Insulation.
   3. Section 07 62 00, Sheet Metal Flashing and Trim.

1.2 REFERENCES

A. Referenced Standards: Standards referenced in this Section are:
   1. ACI 530, Building Code Requirements for Masonry Structures.
   2. ACI 530.1, Specification for Masonry Structures.
   3. ASTM A36, Standard Specification for Carbon Structural Steel.

4. ASTM A82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
5. ASTM A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A615, Standard Specification for Deformed and Plain Carbon - Bars for Concrete Reinforcement.
7. ASTM A1008, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
8. ASTM A1011, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Low-Alloy with Improved Formability.
9. ASTM C5, Standard Specification for Quicklime for Structural Purposes.
10. ASTM C33, Standard Specification for Concrete Aggregates.
11. ASTM C67, Standard Test Method for Sampling and Testing Brick and Structural Clay Tile.
12. ASTM C90, Standard Specification for Hollow Load-Bearing Concrete Masonry Units.
13. ASTM C91, Standard Specification for Masonry Cement.
14. ASTM C62, Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale)
15. ASTM C129, Standard Specification for Non-loadbearing Concrete Masonry Units
16. ASTM C136, Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates.
17. ASTM C140, Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
18. ASTM C144, Standard Specification for Aggregate for Masonry Mortar.
19. ASTM C150, Standard Specification for Portland Cement.
20. ASTM C207, Standard Specification for Hydrated Lime for Masonry Purposes.
21. ASTM C 216, Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
22. ASTM C270, Standard Specification for Mortar for Unit Masonry.
23. ASTM C331, Standard Specification for Lightweight Aggregates for Concrete Masonry Units.
24. ASTM C387, Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
25. ASTM C404, Standard Specification for Aggregates for Masonry Grouts.
26. ASTM C426, Standard Test Method for Linear Drying Shrinkage of Concrete Block.
27. ASTM C 652, Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
28. ASTM C780, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
29. ASTM C1019, Standard Test Method for Sampling and Testing Grout.

30. ASTM C1093, Practice for Accreditation of Testing Agencies for Unit Masonry.
31. ASTM C1314, Standard Test Method for Compressive Strength of Masonry Prisms.
32. ASTM D2240, Standard Test Method for Rubber Property- Durometer Hardness.
33. ASTM D2287, Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds.
34. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
35. ASTM E119, Standard Test Method for Fire Tests of Building Construction and Materials.
36. BIA, Technical Notes on Brick and Tile Construction.
37. BIA, Technical Bulletin 1A, Construction and Protection Recommendations for Cold Weather Masonry Construction.
38. BIA, Technical Notes on Cleaning Clay Products Masonry.
39. NCMA, Guide Specifications and Technical Bulletins.
40. UL 901, Specification for Quicklime for Structural Purposes.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Installer: Hire a single installer regularly engaged in preformed unit masonry installation and with successful and documented experience in erecting unit masonry of scope and type of Work required; and employs only tradesmen with specific skill and successful experience in this type of Work. Submit name and qualifications to ENGINEER with the following information for at least three successful, completed projects:
      a. Names and telephone numbers of owners, architects, or engineers responsible for project.
      b. Approximate contract cost of unit masonry for which installer was responsible.
      c. Amount (square feet) of unit masonry installed.
   2. Laboratory Qualifications:
      a. Testing Laboratory: In accordance with ASTM C1093.

B. Component Supply and Compatibility:
   1. Obtain each type of concrete masonry unit from one Supplier, cured by one process and of uniform texture and color, or in an established uniform blend thereof.
   2. Do not change source or brands of mortar products during the Project.
   3. Where question of compliance to requirements of this Section arise, mortar properties Specification will take precedence over mortar proportion Specification.
   4. Do not change proportions established for mortar accepted under property Specifications, and do not use products with different physical characteristics

in mortar used in the Work, unless compliance with requirements of property Specifications is re-established by submitting acceptable data to ENGINEER.

5. Do not combine two air-entraining materials in mortar.

C. Job Mock-up:

1. Prior to installing unit masonry and after ENGINEER's approval of Samples, erect job mock-ups using products, pattern bond, and joint tooling shown or specified. Build mock-up at the Site, at a location approved by the ENGINEER, of full required wall thickness. Mock-up shall be approximately 4.0 feet by 3.33 feet unless another size or location is shown as job mock-up. Provide special features as directed, including finished opening 16 inches by 16 inches, finished end, and masonry control joint. Indicate proposed range of color, texture and workmanship to be expected in completed Work. Obtain ENGINEER's approval of visual qualities of mock-up before starting unit masonry construction. Retain and protect mock-up during construction as a standard for judging unit masonry Work. Do not alter, move, or destroy mock-up until receiving written permission by ENGINEER.
2. Build as many mock-up panels as required to obtain ENGINEER's approval.
3. Perform unit masonry construction tests per ACI 530.1. Provide to ENGINEER acceptable test results before starting masonry construction.
4. Masonry construction that does not meet standards approved on mock-up panel shall be removed and rebuilt to conform to the Contract Documents. Provide mock-up panel for the following:
    a. Typical complete exterior wall including cavity wall flashing, anchors, and masonry wall ties and all other components of complete exterior wall system.

D. Masonry Pre-installation Conference:

1. Prior to starting unit masonry construction Work, schedule and hold masonry pre-installation conference at the Site, to review foreseeable methods and procedures related to unit masonry Work including:
    a. Project requirements per the Contract Documents.
    b. Structural concept.
    c. Sequence of masonry construction.
    d. Special masonry details.
    e. Required submittals.
    f. Standard of workmanship.
    g. Prism tests or mortar, grout sample and unit masonry tests results.
    i. Quality control requirements.
    j. Job organization and availability of products, tradesmen, equipment, and facilities needed to conform to Progress Schedule.
    k. Masonry control and expansion joint location and materials.
    l. Modular planning requirements.
    m. Weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.
    n. Required special inspection, testing, and certifying procedures.
    o. Compliance with building codes and other Laws and Regulations.

p. Construction Waste Management Plan requirements.

2. Attendance is mandatory for the following:
   a. CONTRACTOR's Site superintendent.
   b. Masonry Subcontractor's Site superintendent.
   c. Masonry Subcontractor's foreman.
   d. Authorized representative of unit masonry Suppliers.
   e. ENGINEER.
   f. Special Inspection Coordinator.
3. If additional information must be developed to adequately cover agenda items, reconvene conference as soon as possible.
4. CONTRACTOR shall record discussions of conference and decisions and agreements (or disagreements) and provide copy of record to each conference attendee.

1.4 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings: Submit the following:
      a. Complete layout of all masonry walls showing modular planning and all special shapes to be used in the Work. Show details for each condition encountered in the Work. Provide plan and elevation views drawn at a scale of 1/4-inch equal to 1.0 foot, and details drawn at a scale of 1.5-inch equal to 1.0 foot. Show all items included in unit masonry construction.
      b. Shop Drawings showing location, extent and accurate configuration and profile of all items shown, specified, and required by this and other Specification Sections included in unit masonry construction.
      c. Shop Drawing for fabrication, bending, and placement of reinforcing bars. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabricating and placing reinforcing for unit masonry Work.
      d. Job Mock-up: Shop Drawings showing location, extent, and accurate configuration of all items to be built into the mock-up. Provide elevations drawn at scale of 1.5 inch equal to 1.0 foot.
   2. Product Data: Submit the following:
      a. Copies of manufacturer's specifications and test data for each type of concrete masonry unit specified, including certification that concrete masonry unit complies with Contract Documents. Include instructions for handling, storage, installation and protection of each type of concrete masonry unit.
   3. Samples: Submit the following:
      a. Color Sample board, for each type of unit masonry specified, showing standard and custom colors.
      b. Each type of unit masonry specified in colors selected by ENGINEER. Select each type of unit masonry to show range of color and texture that can be expected in the Work.
      c. ENGINEER's review will be for color and texture only.

B. Informational Submittals:
   1. Source Quality Control Submittals: Submit the following:
      a. Pre-construction laboratory test results, in accordance with ASTM C140.
   2. Test and Evaluation Reports
      a. Preconstruction testing results as specified in Paragraph 3.1.B of this Section.
   3. Qualification Statements:
      a. Testing laboratory.
      b. Installer.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling of Products:
   1. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage of Materials:
   1. Comply with 01 66 00, Product Storage and Handling Requirements.
   2. Maintain temperatures under cover so that masonry products are above 20 degrees F during installation.

1.6 JOB CONDITIONS

A. Temporary Facilities: Provide supplemental heat sources and equipment as required should CONTRACTOR desire to continue unit masonry Work in cold weather. Pay for fuel for supplemental heat.

B. Environmental Requirements:
   1. Do not perform unit masonry Work when air temperature is below 28 degrees F on a rising temperature, or below 36 degrees F on falling temperatures without providing temporary, heated enclosures, or without providing temporary heating or other precautions to prevent freezing.
   2. Do not use frozen products, and do not build upon frozen unit masonry Work.
   3. Remove and replace all unit masonry Work damaged by cold.

C. Protection:
   1. Protect unit masonry Work against freezing for at least 48 hours after being placed.
      a. For Mean Daily Air Temperatures of 40 degrees F to 32 degrees F: Protect unit masonry construction from precipitation for 48 hours after installation.
      b. For Mean Daily Air Temperatures of 32 degrees F to 25 degrees F: Completely cover unit masonry construction for 48 hours after installation.

c. For Mean Daily Temperatures of 25 degrees F to 20 degrees F: Completely cover unit masonry construction with insulating blankets for 48 hours after installation of the masonry.
d. For Mean Daily Air Temperatures of 20 degrees F and Below: Maintain unit masonry construction above 32 degrees F for 48 hours by enclosure and supplementary heating.

2. When Work is not in progress, protect partially completed unit masonry construction against rapid heat loss and from water entering the masonry by covering the top of walls with a strong, waterproof, non-staining membrane. Extend the membrane at least two feet down both sides of wall and secure in place using wall cover clamps spaced at intervals of four feet and at each end, and at joints in membrane.

D. Cold Weather Unit Masonry Construction:
1. Mortar used in unit masonry construction when mean daily temperature is below 40 degrees F shall be Portland cement-lime-sand mortar using high early strength Portland cement.
2. Clay or shale unit masonry with suctions in excess of 20 grams of water per 30 square inches per minute shall be sprinkled with heated water just prior to installation. Provide water temperature above 70 degrees F when temperature of masonry units is above 32 degrees F. Water temperature shall be above 120 degrees F when temperature of masonry units is below 32 degrees F.
3. For Air Temperatures of 40 degrees F to 32 degrees F: Heat sand or mixing water to a minimum of 70 degrees F and maximum of 160 degrees F.
4. For Air Temperatures of 32 degrees F to 25 degrees F: Heat sand and mixing water to a minimum of 70 degrees F and maximum of 160 degrees F.
5. For Air Temperatures of 25 degrees F to 20 degrees F: Heat sand and mixing water to a minimum of 70 degrees F and maximum of 160 degrees F. Provide heat on both sides of the wall under construction. Employ wind breaks when wind is in excess of 15 mph.
6. For Air Temperatures of 20 degrees F and Below: Heat sand and mixing water to minimum of 70 degrees F and maximum of 160 degrees F. Provide enclosure and auxiliary heat to maintain air temperature above 32 degrees F in the work area. Temperature of masonry units when laid shall not be less than 20 degrees F.

E. Hot Weather Unit Masonry Work: Protect unit masonry Work by methods acceptable to ENGINEER from direct exposure to wind and sun when surrounding air temperature is 99 degrees F in the shade with relative humidity less than 50 percent.

PART 2 - PRODUCTS

2.1 MORTAR MATERIALS

A. Portland Cement: Provide the following for Portland cement-lime mortars:

1. ASTM C150, Type I.
2. Use ASTM C150, Type III high-early strength, for laying masonry when air temperature is less than 50 degrees F.
3. Provide nonstaining Portland cement of natural color.

B. Masonry Cement: Provide the following for masonry cement mortars:
1. ASTM C91 Type S, proportioned to comply with ASTM C270.
2. Maximum Air Content, ASTM C91: 19 percent.
3. Non-staining.

C. Hydrated Lime: ASTM C207 Type S, or lime putty ASTM C5.

D. Sand Aggregates:
1. ASTM C144, except for joints less than ¼-inch, use aggregate graded with 100 percent passing the No. 16 sieve.
2. White Mortar Aggregates: Provide natural white sand or ground white stone for Portland cement-lime mortars.
3. Colored Mortar Aggregates: Provide ground marble, granite, or other sound stone as required to match the sample approved by ENGINEER for Portland cement-lime mortars.
4. Fine Aggregate for Grout: Sand, ASTM C404, Size No. 1.
5. Coarse Aggregate for Grout: ASTM C404, Size No. 8 or Size No. 89.

E. Ready-mixed Mortar: Cementitious materials, water, and aggregate complying with requirements specified for mortar materials, combined with set-controlling admixtures to produce a ready-mixed mortar complying with ASTM C270 and C387.

F. Water: Free from injurious amounts of oils, acids, alkalis, or organic matter, and clean, fresh, and potable.

2.2 MORTAR MIXES

A. General:
1. Anti-freeze Admixture or Agents: Not allowed.
2. Calcium Chloride: Not allowed.

B. Mortar for Unit Masonry: Comply with ASTM C270, Table 2, except limit materials to those specified in this Section, do not substitute ASTM C91 masonry cement for ASTM C150 Portland cement without a submittal approval by ENGINEER, and limit cement to lime ratio by volume as follows:
1. Type M:
a. Provide following proportions by volume:
1) Portland Cement: One part.
2) Hydrated Lime or Lime Putty: 1/4 part.

3) Aggregate Ratio (measured in damp loose condition): Not less than 21/4 and not more than three times sum of volumes of cementitious materials.

b. Properties:
1) Average Compressive Strength, ASTM C270: 2,500 psi.
2) Minimum Water Retention, ASTM C270: 75 percent.
3) Maximum Air Content, ASTM C270: 12 percent.

C. Grout:
1. Coarse Grout:
a. Provide the following proportions by volume:
1) Portland Cement: One part.
2) Hydrated Lime or Lime Putty: Zero to 1/10 part.
3) Fine Aggregate Ratio (Measured in a Damp Loose Condition): Sand shall be not less than 2.25 times and not more than three times sum of volumes of cement and lime.
4) Coarse Aggregate Ratio: Not less than one and not more than two times sum of volumes of cement and lime.
b. Mix grout to have slump of ten inches plus or minus one-inch, at placement.

2.3 CONCRETE MASONRY UNITS

A. General: Concrete masonry units shall comply with requirements below.

B. Hollow and Solid Load-bearing Concrete Masonry Units: ASTM C90, with minimum of 15 percent coal fly ash and 50 percent recycle aggregate as part of concrete mix.

C. Hollow Non-load-bearing Concrete Masonry Units: ASTM C129 with minimum of 15 percent coal fly ash and 50 percent recycle aggregate as part of the concrete mix.

D. Weight:
1. Provide normal weight units using concrete aggregates complying with ASTM C33 producing dry net weight of not less than 125 pounds per cubic foot.

E. Size: Manufacturer’s standard units with nominal face dimensions of 16 inches long by eight inches high by nominal width dimension shown on Drawings (15-5/8-inches by 7-5/8-inches actual).

F. Special Shapes: Provide the following:
1. Lintels, bond beams, reinforcing units, and flush-end reinforcing units, interior and exterior corner shapes, solid jambs, sash block, coves, pre-molded control joint blocks, headers, and other special conditions.

2. Bullnose units for outside vertical corners including doors, windows, louvers and other openings, unless specifically shown by note indicating that this feature is not required.
3. End blocks at all locations where masonry walls abut concrete, or steel columns to facilitate installation of compressible filler, backer rod and sealant or fire-rated fire stop sealant systems, if required.

G. Waterproofing Admixture: Manufacture all types of concrete unit masonry, used in construction of exterior walls (including interior wythe of cavity walls) with an integral waterproofing admixture as follows:
1. Material: Cross-linking acrylic polymer.
2. Proportion: In strict accordance with manufacturer's instructions.
3. Products and Manufacturers: Provide products of one of the following:
a. Dry-Block System by Forrer Industries, a Unit of W. R. Grace & Company Construction Products Division.
b. Eucon Blocktite by Euclid Chemical Company.
c. Or equal.

H. Exposed Faces: Provide manufacturer's standard color and texture.

I. Provide two-core concrete masonry units.

J. Provide concrete masonry units meeting requirements of the Special Inspections.

2.4 BRICK

A. Size: Unless otherwise shown or specified, provide standard modular size brick for 3/8-inch mortar joints, 7-5/8 inches long by 2.25 inches high by 3-5/8 inches wide, actual size for exposed vertical brick when laid as a stretcher.
1. Provide special molded shapes where shown and for applications that cannot be sawed from standard brick sizes.
2. Where brick masonry specified is composed of a mix or range of colors or textures, provide special molded brick masonry shapes in same mix or range of colors or textures as brick masonry specified.

B. Final color and texture selection within specified color range will be by ENGINEER.

C. Solid Face Brick: ASTM C216 Grade SW.
1. Type FBX.
2. Color and Texture: Provide complete selection of manufacturer's standard colors and textures within the following color group:
a. Red color group.
3. Manufacturers: Provide one of the following:
a. Belden Brick Company.
b. Boral Bricks, Inc.
c. Glen-Gery Corporation, an Oldcastle Company.

d. Or equal.

D. Face Brick to Match Existing: Provide color blend similar to existing face brick at adjacent school, and comply with requirements of ASTM C216, Grade SW for type required. If matching brick of this grade is not available, submit to ENGINEER for approval custom manufactured samples that match existing face brick.

E. Provide brick units meeting requirements of the Special Inspections.

2.5 MASONRY ACCESSORIES

A. Continuous Horizontal Wire Reinforcing and Ties for Masonry: Provide the following unless otherwise shown:
   1. General: Welded wire units prefabricated in straight lengths of not less than ten feet, with matching corner "L" and intersection "T" units. Fabricate from cold-drawn steel wire complying with ASTM A82, with deformed continuous 3/16-inch gage side rods and plain 9 gage cross rods, crimped for cavity wall construction, with unit width of 1.5 to two inches less than thickness of wall or partition. All reinforcing and ties shall be hot dipped galvanized after fabrication with 1.5 ounces per square foot of zinc coating complying with ASTM A153, Class B-2, unless otherwise specified.
   2. Multi-wythe Masonry Cavity Walls:
      a. Double-loop wall reinforcing and support system that maintains minimum one-inch in-plane vertical and horizontal adjustability while providing lateral force resistance required for seismic zone shown.
      b. Welded-closed, upward facing, double vertical loop ties with single pair of side rods in interior wythe, and adjustable, rectangular pintle box ties with parallel overlapping ends, spaced not more than 16 inches on centers. Space side rods for embedment in each face shell wall of back up wythe and extend double-loop ties to allow engagement of rectangular pintle box tie snap-locked to seismic resistance clips and for proper embedment in facing wythe.
      c. Rigid, polyvinylchloride or 22-gage steel seismic restraint clips, one for each box tie, 3/16 inches high with four horizontal snap-tight connection grooves, one accommodating nine gage wire and three accommodating 3/16-inch diameter wire.
      d. Continuous, nine gage wire snap-locked into seismic restraint clips for embedment in outer veneer wythe of masonry cavity wall.
      e. High-impact plastic, mechanical, cavity wall insulation restraint washers, one per double loop-lock tie.
      f. Products and Manufacturers: Provide products of one of the following:
         1) Lox-All #180 S.I.S Dub'l Loop-Lok Truss 187-A Seismic Interlock System with Loop-Lok Washers by Hohmann & Barnard, Inc.
         2) DA 3700 S – Seismic Dur-O-Eye; DA 213 QT Lite Duty Seismic Pintel; DA 8706– Pencil Rod; with Shear Lungs by Dur-O-Wal , a Division of Dayton Superior.
         3) Or equal.

B. Anchoring Devices for Masonry: Provide the following, unless otherwise shown:
   1. General: Provide the following:
      a. Cold rolled steel sheet complying with ASTM A1008, hot-rolled steel sheet and strip complying with ASTM A1011, plates and bars complying with ASTM A36 and cold drawn steel wire complying with ASTM A82, all hot-dipped galvanized after fabrication with 1.5 ounces per square foot of zinc coating complying with ASTM A153.
      b. Rectangular, corrugated, one-inch wide ties, fabricated of 12-gage sheet metal, unless otherwise specified.
      c. Size tie lengths to extend to within one-inch of outside face of outer wythe face shell of opposite face of masonry or to maximum depth of 12 inches and between 1.5 inches to two inches less than width of masonry abutting webs and to a maximum depth of 12 inches abutting flanges of structural supports. Provide wire crimped with a vee-drip for use in cavity wall construction.
   2. Weep Holes and Vents:
      a. Provide polyvinylchloride ventilator type weeps.
      b. Product and Manufacturer: Provide products of one of the following:
         1) No. 86 Cell Vents for Brick and Block by Heckmann Building Products
         2) QV-Quadro-Vent for Brick and Block by Hohmann & Barnard, Inc.
         3) No. 3601 Cell Vents for Brick and Block by Wire-Bond.
         4) Or equal.
   3. Cavity Fill Mesh:
      a. Monofilament screen of polypropylene polymers, 1/4-inch mesh hardware cloth.
      b. Install below all block courses that are to be filled with mortar.
      c. Products and Manufacturers: Provide products of one of the following:
         1) No. MGS-Mortar/Grout Screen by Hohmann & Barnard, Inc.
         2) No. 267 Plastic Mesh Wall Tie by Heckmann Building Products.
         3) DA 1015 Dur-O-Stop by Dur-O-Wal, a Dayton Superior Company.
         4) Or equal.
   4. Compressible Filler: Provide watertight joint filler where unit masonry construction abuts structural framework members, or as shown. Provide the following:
      a. Polyurethane foam strip saturated with polybutylene waterproofing material which, when installed at a compression ratio of two-to-one, is impermeable to water.
      b. Resilient to -40 degrees F with 100 percent movement recovery.
      c. Elongation of 140 percent with a tensile strength of not less than 53 pounds per square inch.
      d. Products and Manufacturers: Provide products of one of the following:
         1) Polytite Standard by Polytite Manufacturing Corporation.
         2) Polyseal by Sandell Manufacturing Company, Inc.
         3) Or equal.

C. Miscellaneous Masonry Accessories: Provide the following, where shown:
   1. Reinforcing Bars:
      a. Deformed carbon steel, ASTM A615, Grade 60 for bars No. 3 to No. 18 except as otherwise shown.
   2. Rebar Positioners: Provide the following:
      a. Nine-gage reinforcing bar positioners that accommodate both horizontal and vertical reinforcing steel.
      b. Fabricate units as required for the Work.
      c. Products and Manufacturers: Provide products of one of the following:
         1) #RB Series and #RB-Twin Series Rebar Positioners by Hohmann & Barnard, Inc
         2) Rebar Positioners by Heckmann Building Products.
         3) Or equal.
   3. Masonry Control Joint Components: Provide the following:
      a. Pre-molded Control Joint Strips: Provide complete selection of solid extruded rubber and PVC strips with a Shore A durometer hardness of 80 to 90 complying with ASTM D2240 and D2287, designed to fit standard sash block and maintain lateral stability in masonry wall. Size and configuration shall be as shown.
         1) Products and Manufacturers: Provide products of one of the following:
            a) #RS-8 - Control Joints by Hohmann & Barnard, Inc.
            b) #352-12 Control Joints by Heckmann Building Products.
            c) Or equal.

2.6 SOURCE QUALITY CONTROL

A. Allowable Tolerances: For concrete masonry units provide the following:
   1. Face Dimension: Total variation in finished and installed face dimensions of units shall not exceed 1/16-inch between largest and smallest units in each lot of units of each size.
   2. Distortion: Distortion of plane and edges of face of individual units, as installed, from corresponding plane surface and edges of prefaced concrete masonry unit, shall not exceed 1/16-inch.
   3. Top and Bottom Surfaces: Ground to provide finish height of 7-5/8 inches plus or minus 1/16-inch.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR and installer shall examine areas and conditions under which unit masonry construction Work will be installed, and notify ENGINEER of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

B. Preconstruction Testing: Testing agency shall perform tests prior to installation of unit masonry. Special inspections testing procedures are specified in the referenced standards and the Contract Documents.
   1. Mortar Test: For each mix required, per ASTM C780.
   2. Grout Test: For each mix required, per ASTM C1019 and ACI 530.1.
   3. Prism Test: For each type of construction required, per ASTM C 1314 and ACI 530.1.
   4. Compressive strength of completed concrete unit masonry walls shall not be less than 1,500 psi as determined by methods specified in ACI 530.1.

3.2 PREPARATION

A. Measurement of Mortar Materials:
   1. Cement and Hydrated Lime: Batched by the bag.
   2. Sand: Batched by volume in suitably calibrated containers, provided proper allowance is made for bulking and consolidation and for weight per cubic foot, of contained moisture.
   3. Proportion of Volumetric Mixtures: One 94-pound sack of Portland cement and one 50-pound sack of hydrated lime constitute nominal one cubic foot.
   4. Shovel measurement: Not allowed.

B. Mortar Mixing:
   1. Type of Mixer: Machine mix in approved mixer in which quantity of water is accurately and uniformly controlled.
   2. While mixer is in operation add approximately three-quarters of required water, half the sand, all the cement, then add remainder of sand.
   3. Allow batch to mix briefly then add water in small quantities until satisfactory workability is obtained.
   4. Mix for at least five minutes after all materials have been added.
   5. Hydrated Lime for Mortar Requiring Lime Content: Use dry-mix method. Turn over materials for each batch together until even color of mixed, dry materials indicates that cementitious material has been thoroughly distributed throughout mass, then add water to obtain required plasticity.
   6. Lime putty, if approved for use, shall be prepared in accordance with ASTM C5.
   7. Mixer drum shall be completely emptied before recharging next batch.
   8. Re-tempering of mortar is not allowed.

C. Wetting of Masonry Units:
   1. Face Brick: Wet brick having ASTM C67 absorption rates in excess of 30 grams per 30 square inches per minute, so that rate of absorption when laid does not exceed this amount.
      a. Determine absorption by placing 20 drops of water using a medicine dropper inside one-inch diameter circle on typical units. If water is absorbed within 90 seconds, wet brick before laying.
   2. Use wetting methods that ensure that each masonry unit is nearly saturated but surface-dry when laid.

3. Concrete Masonry Units: Except for absorbent units specified to be wetted, lay masonry units dry. Do not wet concrete masonry units.

D. Cleaning Reinforcement: Before being placed, remove loose rust, mill scale, earth, ice, and other coatings except galvanizing from reinforcement. Do not use reinforcing bars with kinks or bends not shown on Drawings or approved Shop Drawings, or bars with reduced cross-section.

3.3 INSTALLATION, GENERAL

A. Thickness: Build walls, floors and other unit masonry construction work to thickness shown. Build single-wythe walls to actual thickness of masonry units using units of nominal thickness shown or specified.

B. Build chases and recesses as shown or required by others. Provide at least eight inches of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.

C. Leave openings for equipment, piping, ducts, and other items to be installed subsequent to start of masonry Work. After installing said items, complete unit masonry Work to match Work immediately adjacent to openings.

D. Cut masonry units using wet cutting, motor driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining Work neatly. Use full size units without cutting wherever possible.

E. Match Existing Masonry: Match pattern bond and color blend of new unit masonry with adjacent, existing masonry.

3.4 LAYING MASONRY WALLS

A. General:
   1. Mortar Types: Unless otherwise indicated, use mortar as specified and as follows:
      a. For all Work, use Type M mortar.
      b. Use coarse grout fill for structural requirements and for grouting reinforcing steel in unit masonry construction Work.
      c. Do not use mortar that has begun to set or if more than 30 minutes have elapsed since initial mixing. Re-temper mortar during the 30-minute period only as required to restore workability.
   2. Lay out walls in advance for accurate spacing of surface pattern bond with uniform joint widths and to properly locate openings, masonry control joints, returns, and offsets. Avoid using less than half-size units at corners, jambs, and where possible at other locations.
   3. Lay up walls plumb and true to comply with specified tolerances, with courses level, accurately spaced, and coordinated with other Work.
   4. Pattern Bond Unit Masonry:

a. Lay all unit masonry Work visible in the finished Work in running bond with vertical joints in each course centered on units in courses above and below. Avoid using less than full-size units.
b. Bond and interlock each course of each wythe at corners.
c. Do not use units with less than eight-inch horizontal face dimensions at corners or jambs.
d. Interlock alternate courses at corners.

5. Color of Concrete Unit Masonry:
a. Lay all concrete unit masonry of natural color.

B. Construction Tolerances:
1. Variation from Plumb: For lines and surfaces of columns, walls and arises, do not exceed 1/4-inch in 10 feet, or 3/8-inch in a story height (20 feet maximum), nor two-inch in 40 feet or more. Except for external corners, expansion joints and other conspicuous lines, do not exceed 1/4-inch in any story or 20 feet maximum, nor two-inch in 40 feet or more.
2. Variation from Level: For lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4-inch in any bay or 20 feet maximum, nor 3/4-inch in 40 feet or more.
3. Variation of Linear Building Line: For position shown and related portion of columns, walls and partitions, do not exceed two-inch in any bay or 20 feet maximum, nor 3/4-inch in 40 feet or more.
4. Variation in Cross-sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4-inch nor plus two-inch.

C. Mortar Bedding and Jointing:
1. Lay solid masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.
2. Lay hollow masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout.
a. Maintain joint widths shown, except for minor variations required to maintain pattern bond alignment. Lay walls with 3/8-inch joints.
3. Cut joints flush for masonry walls that are to be concealed or to be covered by other materials, except paint, unless otherwise shown.
4. Tool exposed joints, when mortar is "thumbprint" hard, slightly concave. Rake out mortar in preparation for application of calking or sealants where required.
5. Concave-tool exterior joints below grade.
6. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

D. Stopping and Resuming Work: Rake back half-unit masonry length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly, if required, and remove loose masonry units and mortar prior to laying new masonry.

E. Built-in Work:
   1. As the Work progresses, build in items shown, specified or required by others. Fill cores in one block width solidly with masonry around built-in items.
   2. Where built-in items are to be embedded in cores of hollow masonry units, place layer of cavity fill mesh in joint below and rod mortar or grout into core.

F. Horizontal Joint Reinforcing:
   1. Provide continuous horizontal joint reinforcing as specified. Fully embed longitudinal side rods in mortar for their entire length with minimum cover of 5/8-inch on exterior side of walls and 1/2-inch at other locations. Lap reinforcement minimum of six inches at ends of units. Do not bridge masonry control joints with reinforcing.
   2. Reinforce all masonry walls with continuous horizontal joint reinforcing unless specifically noted or specified to be omitted.
   3. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend units in accordance with manufacturer's written instructions.
   4. Space continuous horizontal reinforcing as follows:
      a. Space reinforcing at 16 inches on centers vertically, unless otherwise shown.
   5. Reinforce masonry openings greater than 12 inches wide, with horizontal joint reinforcing placed in two horizontal joints approximately eight inches apart, immediately above lintel and immediately below sill. Extend reinforcing minimum of 2.0 feet beyond jambs of opening.
   6. In addition to wall reinforcing, provide additional reinforcing at openings as required to comply with the Contract Documents.

G. Structural Bonding of Multi-wythe Masonry:
   1. Use continuous reinforcing embedded in horizontal mortar joints for bond tie between wythes as specified in this Section.
   2. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.
      a. For horizontally reinforced masonry, provide continuity at corners with prefabricated "L" units as specified in this Section, in addition to masonry bonding.
   3. Intersecting and Abutting Walls: Unless vertical expansion or masonry control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and space as follows:
      a. Provide masonry bond in alternate courses.
      b. Provide individual metal ties at not more than 2.0 feet on centers vertically, unless shown at closer spacing.
      c. Provide continuity with horizontal joint reinforcing using prefabricated "T" and "L" units.

H. Cavity Walls:
   1. Determine that bituminous dampproofing is installed (refer to Section 07 11 13, Bituminous Dampproofing).
   2. Position insulation as shown and per Section 07 21 05, Building Insulation.
   3. Install cavity drainage material.
   4. Keep cavity clean of mortar droppings during construction by using continuous horizontal board same width as cavity with lifting wires at each end. Board upward before placing horizontal joint reinforcement. Clean mortar droppings from board. Do not clean into cavity. Joints facing cavity shall be struck flush.
   5. Tie exterior wythe to masonry back-up with truss and tab-type continuous horizontal wire reinforcing with individual adjustable hook-type box ties spaced no more than 16 inches on centers vertically and 2.0 feet on centers horizontally. Stagger in alternate courses. Refer to Article 2.6 of this Section for type of ties required.
   6. Tie exterior wythe to concrete back-up with individual dovetail anchors spaced no more than 16 inches on centers vertically and 2.0 feet on centers horizontally. Stagger in alternate courses. Refer to Article 2.6 of this Section for type of anchors required.
   7. Provide weeps in exterior wythe of cavity wall, in all wall foundation courses and immediately above ledges and flashing, spaced 2.0 feet on centers, unless closer spacing is shown. Place weeps sequential when laying masonry. Keep weep holes free of mortar and other obstructions.

I. Structural Reinforced Unit Masonry Construction:
   1. Comply with the requirements of ACI 530.1 and applicable codes.

J. Grouting Structural Reinforced Unit Masonry Construction:
   1. Comply with requirements of ACI 530.1 and applicable codes.

K. Anchoring Masonry Work:
   1. Provide anchoring devices of type specified. If not shown or specified, provide standard type for facing and back up involved in compliance with requirements of Laws and Regulations.
   2. Anchor masonry to structural members where masonry abuts or faces such members to comply with the following:
      a. Provide an open space not less than 1/2-inch or more than one-inch in width between masonry and structural member, unless otherwise shown. Keep open space free of mortar and other rigid materials.
      b. Anchor masonry to cast-in-place concrete and structural steel members using continuous wire ties embedded in mortar and snap-locked into seismic clips and with triangular ties fitted with flexible dovetails for anchorage to cast-in-place concrete.
      c. Space anchors as shown, but not more than 2.0 feet on center vertically and 3.0 feet on center horizontally.

d. Provide end blocks where masonry abuts structural support to facilitate installation of compressible filler, firesafing insulation, backer rod, and sealant.

3. Anchor single wythe masonry veneer to backing with metal ties as follows:
   a. Anchor veneer to structural members with metal anchors embedded in masonry joints and attached to structure. Provide anchors with flexible tie section, unless otherwise shown.
   b. Anchor veneer to concrete and structural steel members using continuous wire ties embedded in mortar and snap-locked into seismic clips with triangular ties, fitted with flexible dovetails for anchorage to cast-in-place concrete, snap-locked to seismic clip and attached to structural supports using anchors specified.
   c. Space anchors as shown, but not more than 2.0 feet on center vertically and 3.0 feet on center horizontally.

L. Masonry Control Joints:
   1. Provide vertical control joints in masonry where shown. Build in related items as unit masonry Work progresses. Rake out mortar in preparation for application of compressible filler, calking and sealants.
   2. Masonry Control Joints Items: Build in sash block and premolded control joint strips as the Work progresses.

M. Lintels and Bond Beams:
   1. Provide masonry lintels and bond beams where openings of 16 inches or more are shown. Provide formed in place masonry lintels and bond beams. Temporarily support formed-in-place lintels and bond beams.
      a. Unless otherwise shown, provide one horizontal number six deformed reinforcing bar for each 4 inches of wall thickness.
      b. For hollow masonry unit walls, use specially formed “U”-shaped lintel and bond beam units with reinforcing bars placed as shown, filled with coarse grout as specified.
   2. Provide minimum bearing at each jamb of eight inches for all openings.
   3. On concrete unit masonry walls where pattern bond remains visually exposed, increase minimum bearing of masonry lintels to maintain joint pattern of wall and install to be indistinguishable from surrounding masonry.

N. Flashing of Masonry Work:
   1. Provide concealed flashings in masonry Work as shown. Refer to Section 07 62 00, Sheet Metal Flashing and Trim, for type of flashing required. Prepare masonry surfaces smooth and free from projections which might puncture flashing. Place through-wall flashing on bed of mortar and cover with mortar. Seal flashing penetrations with mastic before covering with mortar. Terminate flashing two inches from face of wall, unless otherwise shown. Extend flashing at steel lintels in opening heads and turn down.
      a. Extend flashings beyond edge of lintels and sills at least 4 inches and turn up edge on sides, to form pan (end dam), to direct moisture to exterior.

b. Interlock end joints of deformed metal flashings by overlapping deformations not less than 1.5 inches and seal lap with elastic sealant.
c. Seal joints in through wall metal flashing watertight.
d. Install flashings in accordance with manufacturer's instructions.

2. Install reglets and nailers for flashing and other related work where shown to be built into unit masonry construction Work.

3.5 REPAIR, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During tooling of joints, enlarge voids or holes, except weep holes, and completely fill with mortar. Point up all joints at corners, openings and adjacent Work to provide neat, uniform appearance, properly prepared for application of sealant compounds.

C. Cleaning Exposed, Unglazed Masonry Surfaces:
1. Final Cleaning: After mortar is thoroughly set and cured, clean sample wall area of approximately 20 square feet as described below. Obtain ENGINEER's acceptance of sample cleaning before proceeding to clean remainder of masonry Work.
a. Dry-clean to remove large particles of mortar using wood paddles and scrappers. Use chisel or wire brush if required.
b. Presoak wall by saturating with water and flush off loose mortar and dirt.
c. Comply with requirements and recommendations for "Cleaning Clay Products Masonry" of Technical Notes on Brick and Tile Construction by Brick Industry Association for type of masonry and conditions involved in the Work.
d. Apply cleaners per manufacturer's instructions.
e. Protect other Work from cleaning solutions and cleaning operations.
2. Do not use acid cleaning agent, abrasive tools or powders, or metal cleaning tools or wire brushes, unless specifically recommended in writing by manufacturer.

D. Protection:
1. Protect unit masonry construction Work from deterioration, discoloration or damage during subsequent construction operations.

3.6 FIELD QUALITY CONTROL

A. CONTRACTOR shall hire independent testing laboratory acceptable to OWNER and ENGINEER to take samples and conduct tests to evaluate air entrainment, water retention, and compliance of products with Contract Documents, and to

determine compressive strength of mortar and grout. Conduct tests in accordance with ASTM C91. Provide tests results to ENGINEER prior to commencement of Work.

B. After initial test, ENGINEER will require maximum of five additional tests to be conducted at his discretion.

C. Test and inspect all load-bearing concrete unit masonry during construction, meeting the requirements of Level 3 Quality Assurance as defined by ACI 530.1.

D. Masonry walls that do not meet requirements of Special Inspections shall be repaired in manner acceptable to ENGINEER at no expense to OWNER.

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SECTION 05 05 33

ANCHOR SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install anchor systems.
   2. This Section includes all anchor systems required for the Work, but not specified under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before anchor systems Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ACI 318, Building Code Requirements for Structural Concrete.
   2. ACI 350, Code Requirements for Environmental Engineering Concrete Structures.
   3. ACI 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete.
   4. ANSI B212.15, Cutting Tools - Carbide-tipped Masonry Drills And Blanks For Carbide-tipped Masonry Drills.
   5. ANSI/MSS SP-58, Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation.
   6. ASTM A194/A194M, Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
   7. ASTM A276, Specification for Stainless Steel Bars and Shapes.
   8. ASTM A493, Specification for Stainless Steel Wire and Wire Rods for Cold Heading and Cold Forging.
   9. ASTM A563, Specification for Carbon and Alloy Steel Nuts.
   10. ASTM A1011/A1011M, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
   11. ASTM B633, Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
   12. ASTM C307, Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
   13. ASTM C881/C881M, Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
   14. ASTM D695, Test Method for Compressive Properties of Rigid Plastics.

15. ASTM D790, Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
16. ASTM E329, Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
17. ASTM E488, Test Methods for Strength of Anchors in Concrete and Masonry Elements.
18. ASTM F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
19. ASTM F594, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
20. ASTM F1554, Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength.
21. FS A-A-1922A, Shield, Expansion (Caulking Anchors, Single Lead).
22. FS A-A-1923A, Concrete Expansion Anchors.
23. FS A-A-1925A, Shield, Expansion (Nail Anchors).
24. FS A-A-55614, Shield, Expansion (non-drilling expansion anchors).
25. ICC-ES AC01, Acceptance Criteria for Expansion Anchors in Masonry Elements.
26. ICC-ES AC58, Acceptance Criteria for Adhesive Anchors in Masonry Elements.
27. ICC-ES AC60, Acceptance Criteria for Anchors in Unreinforced Masonry Elements.
28. ICC-ES AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
29. ICC-ES AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
30. ISO 3506-1, Mechanical Properties of Corrosion-Resistant Stainless Steel Fasteners -- Part 1: Bolts, Screws and Studs.
31. NSF/ANSI 61, Drinking Water System Components – Health Effects.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Testing Laboratory: Shall comply with ASTM E329 and shall be experienced in tension testing of post-installed anchoring systems.
   2. Post-installed Anchor Installer: Shall be experienced and trained by post-installed anchor system manufacturer in proper installation of manufacturer's products. Product installation training by distributors or manufacturer's representatives is unacceptable unless the person furnishing the training is qualified as a trainer by the anchor manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Listing of all anchor systems products intended for use in the Work including product type, intended location in the Project, and embedded lengths.

2. Product Data:
    a. Manufacturer's specifications, load tables, dimension diagrams, acceptable base material conditions, acceptable drilling methods, and acceptable bored hole conditions.
    b. When required by ENGINEER, copies of valid ICC ES reports that presents load-carrying capacities and installation requirements for anchor systems.

B. Informational Submittals: Submit the following:
    1. Certificates:
        a. For each type of anchor bolt or threaded rod, submit copies of laboratory test reports and other data required to demonstrate compliance with the Contract Documents.
    2. Manufacturer's Instructions:
        a. Installation instructions for each anchor system product proposed for use, including bore hole cleaning procedures and adhesive injection, cure and gel time tables, and temperature ranges (storage, installation and in-service).

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection:
    1. Keep materials dry during delivery and storage.
    2. Store adhesive materials within manufacturer's recommended storage temperature range.
    3. Protect anchor systems from damage at the Site. Protect products from corrosion and deterioration.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. General:
    1. At locations where conditions dictate that Work specified in other Sections is to be of corrosion resistant materials, provide associated anchor systems of stainless steel materials, unless other corrosion-resistant anchor system material is specified. Provide anchor systems of stainless steel materials where stainless steel materials are required in the Contract Documents.
    2. Stainless Steel Nuts:
        a. For anchor bolts and adhesive anchors, provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts for stainless steel anchors used for anchoring equipment, gates, and weirs, and other locations, if any, where the attachment will require future removal for operation or maintenance. Provide lock washer or double nuts on each anchorage device provided for equipment, as required by equipment manufacturer.

b. For other locations, provide for each anchorage device a nut as specified or as required by anchor manufacturer. When ASTM A194/A194M, Grade 8S (Nitronic 60) nuts are not required for anchor bolts and adhesive anchors as specified in this Section, provide anti-seizing compound where stainless steel rods are used with stainless steel nuts of the same type.

3. Materials that can contact potable water or water that will be treated to become potable shall be listed in NSF/ANSI 61.

B. Design Criteria

1. Size, Length, and Load-carrying Capacity: Comply with the Contract Documents. When size, length or load-carrying capacity of anchor system is not otherwise shown or indicated, provide the following:

a. Anchor Bolts: Provide size, length, and capacity required to carry design load based on values and requirements of Paragraph 3.2.A of this Section. For conditions outside limits of critical edge distance and spacing in Paragraph 3.2.A of this Section, minimum anchor bolt embedment as shown or indicated in Paragraph 3.2.A of this Section apply and capacity shall be based on requirements of Laws and Regulations, including applicable building codes.

b. Adhesive Anchors, Expansion Anchors, or Concrete Inserts: Provide size, length, type, and capacity required to carry design load. Anchor capacity shall be based on the procedures required by the building code in effect at the Site. Where Evaluation Service Reports issued by the ICC Evaluation Service are required in this Section, anchor capacities shall be based on design procedure required in the applicable ICC Evaluation Service Report.

1) General: Determine capacity considering reductions due to installation and inspection procedures, embedment length, strength of base fastening materials, spacing, and edge distance, as indicated in the manufacturer's design guidelines. For capacity determination, concrete shall be assumed to be in the cracked condition, unless calculations demonstrate that the anchor system will be installed in an area that is not expected to crack under any and all conditions of design loading.

2) Concrete Adhesive Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum embedment depth of the greater of the following: required to develop tensile strength of anchor, or a minimum embedment of 10 anchor diameters; and minimum anchor spacing and edge distance of 12 anchor diameters.

3) Concrete Masonry Adhesive Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum anchor spacing and edge distance as indicated in anchor manufacturer's instructions.

4) Concrete Expansion Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide

minimum embedment depth of six anchor diameters, and minimum anchor spacing and edge distance of seven anchor diameters.

5) Concrete Masonry Expansion Anchors: Unless otherwise shown or indicated in the Contract Documents or approved by ENGINEER, provide minimum anchor spacing and edge distance as indicated in anchor manufacturer's instructions.

6) Concrete Undercut Anchors: Unless otherwise shown or indicated in the Contract Documents, or approved by ENGINEER, provide minimum anchor spacing and edge distance as tabulated in anchor manufacturer's instructions.

2. Design Loads. Comply with the Contract Documents. When design load of supported material, equipment, or system is not otherwise shown or indicated, provide the following:
   a. Equipment Anchors: Use design load recommended by equipment manufacturer. When equipment can be filled with fluid, use loads that incorporate equipment load and load imposed by fluid.
   b. Pipe Hangers and Supports: Use full weight of pipe, and fluid contained in pipe that are tributary to the support plus the full weight of valves and accessories located between the hanger or support being anchored and the next hanger or support.
   c. Hangers and Supports for Electrical Systems, and HVAC, Plumbing, and Fire Suppression Systems and Piping: Use the full weight of supported system that is tributary to the support plus the full weight of accessories located between the hanger or support being anchored and the next hanger or support. When piping or equipment is to be filled with fluid, anchor systems shall be sized to support such loads in addition to the weight of the equipment, piping, or system, as applicable.
   d. Delegated Design: When anchor systems are used for supporting materials, equipment, or systems delegated to a design professional retained by CONTRACTOR, Subcontractor, or Supplier, provide anchor system suitable for loads indicated in delegated design documents and consistent with the design intent expressed in the Contract Documents.

C. Application:
   1. Anchor Bolts:
      a. Where anchor bolt is shown or indicated, use cast-in-place anchor bolt unless another anchor type is approved by ENGINEER.
      b. Provide anchor bolts as shown or indicated, or as required to secure structural element to appropriate anchor surface.
   2. Concrete Adhesive Anchors:
      a. Use where adhesive anchors are shown or indicated for installation in concrete.
      b. Suitable for use where subject to vibration.
      c. Suitable for use in exterior locations or locations subject to freezing.
      d. Suitable for use in submerged, intermittently submerged, or buried locations.

e. Do not use in overhead applications, unless otherwise shown or approved by ENGINEER.
f. Do not use for pipe hangers, unless otherwise shown or approved by ENGINEER.

3. Concrete Masonry Adhesive Anchors:
   a. Use where adhesive anchors are shown or indicated for installation in grout-filled or hollow masonry units.
   b. Suitable for use where subject to vibration.
   c. Suitable for use in exterior locations or locations subject to freezing.
   d. Do not use for pipe hangers, unless otherwise shown or approved by ENGINEER.
4. Concrete Wedge Expansion Anchors:
   a. Use where expansion anchors are shown or indicated for installation in concrete.
   b. Do not use where subject to vibration.
   c. Do not use in exterior locations or locations subject to freezing.
   d. Do not use in submerged, intermittently submerged, or buried locations.
   e. Suitable for use in overhead applications.
5. Grout-filled Concrete Masonry Wedge Expansion Anchors:
   a. Use where expansion anchors are shown or indicated for installation on the interior face of grout-filled unit masonry.
   b. Do not use where subject to vibration.
   c. Do not use in exterior locations or locations subject to freezing.
6. Hollow Concrete Masonry Sleeve Expansion Anchors:
   a. Use where expansion anchors are shown or indicated for installation in hollow concrete unit masonry or solid brick.
   b. Do not use for attaching safety-related systems, such as piping conveying hazardous or potentially hazardous materials, or fire suppression systems.
   c. Do not use where subject to vibration.
   d. Do not use in exterior locations or locations subject to freezing.
7. Drop-in Expansion Anchors:
   a. Use drop-in expansion anchors installed in concrete where light-duty anchors are required to support piping or conduit two-inch diameter or smaller.
   b. Do not use for attaching safety-related systems, such as piping conveying hazardous or potentially hazardous materials, or fire suppression systems.
   c. Do not use where subject to vibration.
   d. Do not use at submerged, intermittently submerged, or buried locations.
   e. Do not use in exterior locations or locations subject to freezing.
   f. Suitable for use in overhead applications.
8. Concrete Undercut Anchors:
   a. Use where undercut anchors are shown or indicated for installation in concrete.
   b. Suitable for use where subject to vibration.

c. Do not use in submerged, intermittently submerged, or buried locations.
d. Do not use in exterior locations or locations subject to freezing.
e. Suitable for use in overhead applications.

9. Concrete Inserts:
   a. Use only where shown or indicated in the Contract Documents.
   b. Allowed for use to support pipe hangers and pipe supports for pipe size and loading recommended by the concrete insert manufacturer.
10. Drive-In Expansion Anchors:
   a. Use drive-in expansion anchors installed in concrete, precast concrete, grouted masonry units, or brick, where light-duty anchors are required to support piping or conduit one-inch diameter and smaller.
   b. Do not use for attaching safety-related systems, such as piping conveying hazardous or potentially hazardous materials, or fire suppression systems.
   c. Do not use in overhead applications.
11. For Use in Precast Concrete Planks:
   a. To support piping or conduit six-inch diameter and smaller, use low-profile drop-in anchors, hollow concrete masonry adhesive anchors, or through-bolts.
   b. For piping greater than six-inch diameter, or to support safety-related systems, use through-bolts. Each through-bolt shall consist of threaded rod, nuts, washers, and bearing plate.

2.2 MATERIALS

A. Anchor Bolts:
   1. Interior Dry Non-corrosive Locations: Provide straight threaded carbon steel rods complying with ASTM F1554, Grade 36 , with heavy hex nuts complying with ASTM A563 Grade A , unless otherwise shown or indicated on the Drawings. Hooked anchor bolts are unacceptable.
   2. Exterior, Buried, Submerged Locations, or When Exposed to Wastewater: Provide stainless steel straight threaded rods complying with ASTM F593, AISI Type 316, Condition A, with ASTM F594, AISI Type 316, stainless steel nuts. Provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts where required. Other AISI types may be used when approved by ENGINEER. Hooked bolts are unacceptable.
   3. Equipment: Provide anchor bolts complying with material requirements of this Section and equipment manufacturer's requirements relative to size, embedment length, and anchor bolt projection. Anchor bolts shall be straight threaded rods with washers and nuts as specified in this Section. Hooked bolts are unacceptable.
   4. Anchoring of Structural Elements: Provide anchor bolts of size, material, and strength shown or indicated in the Contract Documents.

B. Concrete Adhesive Anchors:
   1. General:

a. Adhesive anchors shall consist of threaded rods anchored into hardened concrete using an adhesive system.

2. Products and Manufacturers: Provide one of the following:
   a. HIT-RE 500-SD Injection Epoxy Adhesive Anchoring System, by Hilti Fastening Systems, Inc.
   b. SET-XP Epoxy-Tie Adhesive, by Simpson Strong-Tie Company, Inc.
   c. Or equal.
3. Adhesive:
   a. Adhesive system shall use two-component adhesive mix.
   b. Epoxy adhesives shall comply with physical requirements of ASTM C881/C881M, Type IV, Grade 2 and 3, Class A, B, and C, except gel times.
   c. Adhesives shall have a current evaluation report by ICC Evaluation Service for use in both cracked and uncracked concrete with seismic recognition for SDC A through F as tested and assessed in accordance with ICC-ES AC308.
   d. Adhesives shall have minimum bond strength and minimum design bond strength (bond strength multiplied by strength reduction factor) in accordance with Table 05 05 33-A:

TABLE 05 05 33-A:
ADHESIVE BOND STRENGTH [1,2]

Anchor	Uncracked Concrete		Cracked Concrete	
Rod Diameter / Dowel Size	**Bond Strength (psi)**	**Design Bond Strength (psi)**	**Bond Strength (psi)**	**Design Bond Strength (psi)**
3/8-inch / #3	2040	1300	1090	700
1/2-inch / #4	1920	1200	920	560
5/8-inch / #5	1830	1150	710	390
3/4-inch / #6	1760	1050	710	460
7/8inch / #7	1670	900	610	340
1-inch / #8	1650	1050	850	460
- / #9	1900	1000	800	400
1.25-inch/ #10	1580	1000	730	400

Table Notes:
1. Bond strengths listed for hammer-drilled, dry hole.
2. Bond strengths listed for maximum short term concrete temperature of 110 degrees F and maximum long term concrete temperature of 75 degrees F.

4. Anchor:
   a. Provide continuously-threaded, AISI Type 316 stainless steel adhesive anchor rod. Threaded rods shall comply with the concrete adhesive anchor manufacturer's specifications as included in the ICC Service Evaluation Report for the anchor submitted. Nuts shall have specified proof load stresses equal to or greater than the minimum tensile strength of the stainless steel threaded rod used. Provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts where required.

C. Concrete Masonry Adhesive Anchors:
   1. General:
      a. Grout-filled concrete masonry adhesive anchors shall consist of threaded rods anchored into grout-filled concrete block masonry using an adhesive system.
      b. Hollow concrete masonry adhesive anchors shall consist of threaded rods with a cylindrical mesh steel or plastic screen tube anchored into hollow concrete block masonry using an adhesive system.
   2. Products and Manufacturers: Provide one of the following:
      a. HIT-HY 70 Hybrid Adhesive Anchor System, by Hilti Fastening Systems, Inc.
      b. Acrylic-Tie Adhesive, by Simpson Strong-Tie Company, Inc.
      c. Or equal.
   3. Adhesive:
      a. Adhesive system shall use two-component adhesive mix.
      b. Hybrid adhesives shall comply with the following:
         1) ASTM D695 compressive yield strength greater than 7,200 psi on a seven-day cure.
      c. Adhesives shall have current ICC Evaluation Service Report for use in grout-filled concrete masonry, tested and assessed in accordance with ICC-ES AC 58 and ICC-ES AC 60.
   4. Anchor:
      a. Provide stainless steel adhesive anchor rod complying with ASTM F593, AISI Type 316, Condition CW, with ASTM F594, AISI Type 316 stainless steel nuts. Provide ASTM A194/A194M, Grade 8S (Nitronic 60) stainless steel nuts where required.
   5. Mesh Screen Tube (for hollow masonry applications):
      a. Provide with mesh size, length, and diameter as specified by adhesive anchor manufacturer.

D. Concrete Wedge Expansion Anchors:
   1. General:
      a. Concrete wedge expansion anchors shall consist of stud, wedge, nut, and washer.
   2. Products and Manufacturers: Provide one of the following:
      a. Kwik Bolt TZ Wedge Anchor, by Hilti Fastening Systems, Inc.
      b. Strong Bolt 2 Wedge Anchor, by Simpson Strong-Tie Company, Inc.
      c. Or equal.
   3. Anchors shall comply with physical requirements of FS A-A-1923A, Type 4. Provide concrete wedge expansion anchors suitable for use in cracked and uncracked concrete in accordance with ACI 318 and ACI 350, Appendix D. Demonstrate suitability of cracked concrete wedge anchors in accordance with ACI 355.2 prequalification tests.
   4. Interior Dry Non-corrosive Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.

5. Other Locations: Provide expansion anchors complete with nuts and washers, AISI Type 304 stainless steel anchor body, in accordance with ASTM A276 or ASTM A493.
6. Concrete wedge expansion anchors shall have a current ICC Evaluation Service Report for use in both cracked and uncracked concrete with seismic recognition in seismic design Categories A through F when tested and assessed in accordance with ICC-ES AC193.

E. Grout-filled Masonry Wedge Expansion Anchors:
1. General:
   a. Grout-filled masonry wedge expansion anchors shall each consist of stud, wedge, nut, and washer.
2. Product and Manufacturers: Provide one of the following:
   a. Kwik-Bolt 3 Expansion Anchors, by Hilti Fastening Systems, Inc.
   b. Wedge-All Wedge Anchors, by Simpson Strong-Tie Company, Inc.
   c. Or equal.
3. Anchors shall comply with physical requirements of FS A-A-1923A, Type 4. Anchors shall be non-bottom bearing type with single-piece steel expansion clip providing 360-degree contact with base material and shall not require oversized holes for installation.
4. Interior Dry Non-corrosive Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
5. Other Locations: Provide AISI Type 316 stainless steel anchor, complete with nut and washer, in accordance with ASTM A276 or ASTM A493.
6. Grout-filled masonry wedge expansion anchors shall have a current ICC Evaluation Service report for use in fully-grouted concrete masonry construction when tested and assessed in accordance with ICC-ES AC01.

F. Hollow Concrete Masonry Sleeve Expansion Anchors:
1. General:
   a. Sleeve expansion anchors shall each consist of an externally threaded stud with full length expanding sleeve.
2. Products and Manufacturers: Provide one of the following:
   a. HLC Sleeve Anchors, by Hilti Fastening Systems, Inc.
   b. Dynabolt Sleeve Anchors, by ITW Red Head.
   c. Or equal.
3. Anchors shall comply with physical requirements of FS A-A-1922A. Anchors shall be non-bottom bearing type with single-piece steel expansion sleeve providing 360-degree contact with base material, and shall not require oversized holes for installation.
4. Interior Dry Non-corrosive Locations: Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633.
5. Other Locations: Provide expansion anchors complete with nuts and washers, Type 304 stainless steel, in accordance with ASTM A276 or ASTM A493.

G. Drop-in Expansion Anchors:
   1. General:
      a. Drop-in expansion anchors shall each consist of an internally threaded, deformation-controlled expansion anchor with pre-assembled expander plug.
   2. Products and Manufacturers: Provide one of the following:
      a. HDI Drop-In Anchors, by Hilti Fastening Systems, Inc.
      b. Drop-In Anchor, by Simpson Strong-Tie Company, Inc.
      c. Or equal.
   3. Provide carbon steel anchors complete with nuts and washers, zinc plated, in accordance with ASTM B633, complying with physical requirements of FS A-A-55614, Type I. Anchors shall be flush or shell type. Provide low-profile anchors for use in precast concrete planks.

H. Concrete Undercut Anchors:
   1. General:
      a. Each concrete undercut anchor shall consist of threaded stud, thick-walled expansion sleeve, expander coupler, and nut and washer. Anchors shall be pre-set type or through-set type, as shown on the Drawings.
   2. Products and Manufacturers: Provide one of the following:
      a. HDA Undercut Anchor, by Hilti Fastening Systems, Inc.
      b. DUC Ductile Undercut Anchor, by USP Structural Connectors.
      c. Or equal
   3. Provide concrete undercut expansion anchors in accordance with ACI 318 and ACI 350, Appendix D. Demonstrate suitability of cracked concrete undercut anchors in accordance with ACI 355.2 prequalification tests.
   4. Installed anchor shall exhibit form fit between bearing elements and the undercut in the concrete.
   5. Interior Dry Non-Corrosive Locations: Provide carbon steel anchors, complete with nuts and washers, zinc plated, in accordance with ASTM B633.
   6. Other Locations: Provide stainless steel anchors, complete with nuts and washers, manufactured of AISI Type 316 stainless steel or materials complying with ISO 3506-1 and having corrosion resistance equivalent to AISI Type 316 stainless steel.
   7. Concrete undercut anchors shall have a current ICC Evaluation Service Report for use in both cracked and uncracked concrete for seismic recognition for seismic design Categories A through F when tested and assessed in accordance with ICC-ES AC193.

I. Concrete Inserts:
   1. Manufacturers: Provide products of one of the following:
      a. Unistrut Corporation.
      b. Cooper B-Line, Inc.
      c. Anvil International, Inc.
      d. Or equal.
   2. Spot Concrete Inserts:

a. Provide inserts recommended by insert manufacturer for required loading. Inserts shall comply with ANSI/MSS SP-58, malleable iron, Type 18. Spot inserts shall allow for lateral adjustment and have means for attachment to forms. Provide nuts compatible with insert and to suit threaded hanger rod sizes.

3. Continuous Concrete Inserts:
   a. Provide inserts recommended by insert manufacturer for required loading. Inserts shall be continuous type and shall be manufactured from minimum 12-gage cold-formed channel sections, complying with ASTM A1011/A1011M, stainless steel, Grade 33, complete with styrofoam inserts, end caps, and means for attaching to forms. Provide channel nuts compatible with insert suitable for threaded hanger rod sizes.
4. Provide inserts with plain finish.

J. Drive-In Expansion Anchors:
   1. General:
      a. Drive-In expansion anchors shall each consist of stainless steel drive pin and expanding alloy body.
   2. Products and Manufacturers: Provide one of the following:
      a. Metal HIT Anchor, by Hilti Fastening Systems, Inc.
      b. Zinc Nailon Anchor, by Simpson Strong-Tie Company, Inc.
      c. Or equal.
   3. Provide Type 304 stainless steel drive pin with zinc alloy body. Anchor shall comply with physical requirements of FS A-A-1925A, Type 1.

K. Unless approved by ENGINEER, do not use power-actuated fasteners or other types of bolts and fasteners not specified in this Section.

L. Anti-Seizing Compound:
   1. Products and Manufacturers: Provide one of the following:
      a. Pure Nickel Never-Seez, by Bostik.
      b. Nickel-Graf, by Anti-Seize Technology.
      c. Or equal.
   2. Provide pure nickel anti-seizing compound.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials will be installed and advise ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Anchor Bolts:
   1. Provide anchor bolts as shown or indicated in the Contract Documents, or as required to secure structural element to the appropriate anchor surface.
   2. Locate and accurately set anchor bolts using templates or other devices as required, prior to placing concrete. Wet setting of anchor bolts is unacceptable.
   3. Protect threads and shank from damage during installation and subsequent construction operations.
   4. Unless otherwise shown or approved by ENGINEER anchor bolts shall comply with Table 05 05 33-B:

TABLE 05 05 33-B:
SINGLE ANCHOR ALLOWABLE LOADS ON ANCHOR BOLTS [1]

Bolt Diameter (inch)	F1554 Grade 36 F593 Type 316, Condition A				F1554 Grade 55			
	Minimum Embedment (inch)	Minimum Edge Distance and Spacing[2] (inch)	Shear[3,4] (lb)	Tension[3] (lb)	Minimum Embedment (inch)	Minimum Edge Distance and Spacing[2] (inch)	Shear[3] (lb)	Tension[3] (lb)
1/2	6	9	1,262	2,420	8.5	12.75	1,660	3,190
5/8	7.5	11.25	2,010	3,860	10.5	15.75	2,640	5,080
3/4	9	13.5	2,974	5,720	13	19.5	3,910	7,520
7/8	10.5	15.75	4,106	7,890	15	22.5	5,400	10,390
1	12	18	5,386	10,360	17	25.5	7,090	13,450
1 1/8	13.5	20.25	6,787	13,052	19	28.5	8,930	16,580
1 1/4	15	22.5	8,617	16,572	21	31.5	11,340	20,040

Table Notes:
1. Table is based on ACI 318 and ACI 350, Appendix D, f'_c = 4000 psi. Table 05 05 33-B is not applicable to anchor bolts embedded in grouted masonry.
2. Critical edge distance and spacing are indicated in the table. Capacity of anchor bolts for other combination of edge distances and spacing shall be evaluated in accordance with ACI 318 and ACI 350, Appendix D.
3. Values for shear and tension listed are not considered to act concurrently. Interaction of tension and shear will be evaluated by ENGINEER in accordance with ACI 318 and ACI 350, Appendix D.

B. Adhesive Anchors, Undercut Anchors, and Expansion Anchors – General:
   1. Prior to drilling, locate existing reinforcing steel in vicinity of proposed holes. If reinforcing conflicts with proposed hole location, obtain ENGINEER's approval of alternate hole locations to avoid drilling through or damaging existing reinforcing bars.

C. Adhesive Anchors:
   1. Comply with manufacturer's written installation instructions and the following.
   2. Drill holes to adhesive system manufacturer's recommended drill bit

diameter to the specified depth. Drill holes in hammering and rotation mode with carbide-tipped drill bits that comply with the tolerances of ANSI B212.15. Core-drilled holes are unacceptable.

3. Before setting adhesive anchor, hole shall be made free of dust and debris by method recommended by adhesive anchor system manufacturer. Hole shall be brushed with adhesive system manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles. Hole shall be dry as defined by adhesive system manufacturer.
4. Before injecting adhesive, obtain ENGINEER's concurrence that hole is dry and free of oil and other contaminants.
5. Prior to injecting adhesive into the drilled hole, dispense, to a location appropriate for such waste, an initial amount of adhesive from the mixing nozzle, until adhesive is uniform color.
6. Inject adhesive into hole through injection system-mixing nozzle and necessary extension tubes, placed to bottom of hole. Discharge end shall be withdrawn as adhesive is placed but kept immersed to prevent formation of air pockets. Fill hole to depth that ensures that excess material is expelled from hole during anchor placement.
7. Twist anchors during insertion into partially-filled hole to guarantee full wetting of rod surface with adhesive. Insert rod slowly to avoid developing air pockets.
8. Provide adequate curing in accordance to adhesive system manufacturer's requirements prior to continuing with adjoining Work that could place load on installed adhesive anchors. Do not begin adjoining Work until adhesive anchors are successfully tested or when allowed by ENGINEER.
9. Limitations:
    a. At time of anchor installation, concrete shall have compressive strength (f'c) of not less than 2,500 psi.
    b. At time of anchor installation, concrete shall have age of not less than 21 days.
    c. Installation Temperature: Comply with manufacturer's instructions for installation temperature requirements. Provide temporary protection and other measures, such as heated enclosures, necessary to ensure that base material temperature complies with anchor systems manufacturer's requirements during installation and curing of adhesive anchor system.
    d. Oversized Holes: Advise ENGINEER immediately if size of drilled hole is larger than recommended by anchor system manufacturer. Cost of corrective measures, including but not limited to redesign of anchors due to decreased anchor capacities, shall be paid by CONTRACTOR.
    e. Embedment depths shall be based on installation in normal-weight concrete with compressive strength of 2,500 psi when embedded in existing concrete, and 4,000 psi when embedded in new concrete.

D. Expansion Anchors:

1. Comply with expansion anchor manufacturer's written installation instructions and the following:
2. Drill holes using anchor system manufacturer's recommended drill bit diameter and to the specified depth. Drill holes in hammering and rotation mode with carbide-tipped drill bits complying with tolerances of ANSI B212.15. Core drilled holes are unacceptable.
3. Before installing anchor, hole shall be made free of dust and debris by method recommended by anchor system manufacturer. Hole shall be brushed with anchor system manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles.
4. Before installing anchor, obtain ENGINEER's concurrence that hole is dry and free of oil and other contaminants.
5. Protect threads from damage during anchor installation. Drive anchors not less than four threads below surface of the attachment. Set anchors to anchor manufacturer's recommended torque using a torque wrench.

E. Concrete Undercut Anchors:
1. Comply with undercut anchor manufacturer's written installation instructions and the following.
2. Protect threads from damage during anchor installation.
3. Drill hole to anchor manufacturer's specified depth and diameter using a drill bit matched to the specific anchor.
4. Before setting the undercut anchor, hole shall be free of dust and debris using method recommended by undercut anchor system manufacturer. Hole shall be blown clean with clean, dry, oil-free compressed air to remove all dust and loose particles.
5. Insert the anchor by hand until anchor reaches bottom of hole.
6. Set anchor in accordance with manufacturer's instructions using anchor manufacturer's specified setting tool.
7. Verify that the setting mark is visible on the threaded rod above the sleeve.
8. Anchor shall be set to manufacturer's recommended torque, using a torque wrench.

F. Concrete Inserts:
1. Comply with concrete insert manufacturer's installation instructions.
2. Inserts shall be flush with slab bottom surface.
3. Protect embedded items from damage during concrete placing. Ensure that embedded items are securely fastened to prevent movement during concrete placing, and ensure that embedded items do fill with concrete during concrete placing.
4. Inserts intended for piping greater than four-inch diameter shall be provided with hooked rods attached to concrete reinforcing.

G. Anti-Seizing Compound:
1. Provide anti-seizing compound in accordance with anti-seizing compound manufacturer's installation instructions, at locations indicated in Paragraph 2.1.B of this Section.

2. Do not use anti-seizing compound at locations where anchor bolt or adhesive anchor will contact potable water or water that will be treated to become potable.

3.3 CLEANING

A. After embedding concrete is placed, remove protection and clean bolts and inserts.

3.4 FIELD QUALITY CONTROL

A. Site Tests:
   1. Furnish services of independent testing laboratory to perform field quality tensile testing of production adhesive anchors at the Site, unless otherwise specified.
      a. Testing shall comply with ASTM E488.
      b. Test at least ten percent of all types of adhesive anchors. If one or more adhesive anchors fail the test, CONTRACTOR shall pay cost of testing, or at ENGINEER's option CONTRACTOR may arrange for testing paid by CONTRACTOR, for all adhesive anchors of same diameter and type installed on the same day as the failed anchor. If anchors installed on the same day as the failed anchor also fail the test, ENGINEER may require retesting of all anchors of the same diameter and type installed in the Work. CONTRACTOR shall be responsible for retesting costs.
      c. ENGINEER will direct which adhesive anchors are to be tested and indicate test load to be used
      d. Apply test loads with hydraulic ram.
      e. Displacement of post-installed anchors shall not exceed D/10, where D is nominal diameter of anchor being tested.
         1) Load each test anchor to failure.
         2) Testing shall comply with ASTM E488.
         3) Apply test loads with hydraulic ram.
      d. Anchors that fail to reach the specified test load shall be considered as not passing the test and shall be re-tested at no additional cost to OWNER.
      e. Testing agency shall submit test results to CONTRACTOR and ENGINEER within 24 hours of completion of test.
   2. Correct defective Work by removing and replacing or correcting, as directed by ENGINEER.
   3. CONTRACTOR shall pay for all corrections and subsequent testing required to confirm competence in the installation of post-installed mechanical anchors.
   4. Testing agency shall submit test results to CONTRACTOR and ENGINEER within 24 hours of completion of test.

B. Manufacturer's Services:

1. Provide at the Site services of qualified adhesive manufacturer's representative during initial installation of adhesive anchor systems to train CONTRACTOR's personnel in proper installation procedures. Manufacturer's representative shall observe to confirm that installer demonstrates proper installation procedures for adhesive anchors and adhesive material.

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SECTION 05 14 00

STRUCTURAL ALUMINUM FRAMING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install structural aluminum framing.
   2. The Work also includes:
      a. Providing openings in and attachments to structural aluminum framing to accommodate the Work under this and other Sections, and providing for structural aluminum framing items such as anchorage devices, studs, and all items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before structural aluminum framing Work.

C. Related Sections:
   1. Section 03 60 00, Grouting.
   2. Section 05 05 33, Anchor Systems.
   3. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AA ADM-1, Aluminum Design Manual – Specifications for Aluminum Structures.
   5. ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   6. ASTM B211, Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
   7. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
   8. ASTM B308/B308M, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
   9. ASTM B429/B429M, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
   11. ASTM F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

12. ASTM F594, Specification for Stainless Steel Nuts.
13. AWS D1.2/D1.2M, Structural Welding Code - Aluminum.
14. NAAMM AMP 500, Metal Finishes Manual for Architectural and Metal Products.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Welders and Welding Processes:
      a. Qualify welding processes and welding operators in accordance with AWS D1.2/D1.2M.
      b. When requested by ENGINEER, provide certification that all welders employed on or to be employed on the Work have satisfactorily passed AWS qualification tests within previous 12 months. Ensure that all certifications are current.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Complete details and schedules for fabrication and shop assembly of members and details, schedules, procedures, and diagrams showing proposed sequence of erection. Shop Drawings shall not be reproductions of Contract Drawings.
      b. Include complete information for fabrication of the structure's components, including location, type, and size of bolts, details of blocks, copes and cuts, connections, camber, holes, member sizes and lengths, and other pertinent data. Clearly indicate welds using standard AWS notations and symbols, and clearly show or indicate size, length, and type of each weld.
      c. Provide setting drawings, templates, and directions for installing anchorage devices.

B. Informational Submittals: Submit the following:
   1. Certificates.
      a. Welders' certifications, when requested by ENGINEER.
   2. Test Reports.
      a. Laboratory test reports and other data required to show compliance with the Contract Documents for the following:
         1) Mill test report documenting chemical and physical properties of each type of aluminum framing material.
         2) Mill test report documenting chemical and physical properties of stainless steel connection bolts, nuts, and washers.
   3. Field Quality Control Submittals:
      a. Submit results of testing and inspection performed at the Site by testing agency employed by CONTRACTOR.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the Site at such intervals to ensure uninterrupted progress of the Work.

B. Storage:
   1. Do not store materials in a manner that could cause distortion or damage to the members. Repair or replace damaged materials as directed by ENGINEER.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Aluminum Types:
   1. Aluminum Shapes: ASTM B308/B308M, Alloy 6061-T6, ASTM B221, Alloy 6061-T6.
   2. Aluminum Tubes and Pipes: ASTM B429, Alloy 6061-T6.
   3. Aluminum Bars and Rods: ASTM B211, Alloy 6061-T6.
   4. Aluminum Plates: ASTM B209, Alloy 6061-T6.

B. Anchorages, Fasteners, and Connectors:
   1. Anchorage Devices: Refer to Section 05 05 33 Anchor Systems.
   2. Threaded Fasteners: Stainless steel bolts, ASTM F593, AISI Type 303, and stainless steel nuts and washers, ASTM F594, AISI Type 303.

C. Electrodes for Welding: ER 5356 complying with AWS D1.2/D1.2M.

D. Finish: Provide mill finish as specified in NAAMM AMP 500.

2.2 FABRICATION

A. Shop Fabrication and Assembly:
   1. General:
      a. Fabricate and assemble structural assemblies in the shop to greatest extent possible. Fabricate items of structural aluminum in accordance with AA ADM-1, the Contract Documents, and as shown on approved Shop Drawings. Provide camber in structural members as shown.
      b. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize handling of materials for storage and minimize handling at the Site.
      c. Where finishing is required, complete the assembly, including welding of units, before commencing finishing operations. Provide finish surfaces of members exposed-to-view in the completed Work that are free of markings, burrs, and other defects.
      d. Design of Members and Connections:

1. Details shown on the Drawings are typical; similar details apply to similar conditions, unless otherwise shown or specified.

B. Connections:
   1. Shop Connections:
      a. Unless otherwise shown or indicated, shop connections may be welded or stainless steel bolted. Unless shown otherwise, welds shall be 1/4-inch minimum.
      b. Where reaction values of a beam are not shown or indicated, connections shall be detailed to support the total uniform load capacity tabulated in AA ADM-1 tables for allowable loads on beams for the given shape, span, and aluminum specified for beam in question.
      c. Shop-welded connections shall be detailed to eliminate or minimize eccentricity in the connection.
      d. End connection angles fastened to webs of beams and thickness of angles, size and extent of fasteners or shop welds, shall comply with design standards in AA ADM-1. Connections shall be two-sided unless otherwise shown or indicated.
   2. Fabrication Considerations Regarding Field Connections:
      a. Unless otherwise specified below or indicated, make field connections using stainless steel bolts.
      b. Field welding is not allowed.
   3. Bolted Construction:
      a. Stainless steel design shear values shall be based on bolts with bearing type connections with threads in the shear plane.
      c. Minimum bolt diameter shall be 3/4-inch, unless otherwise shown or indicated.
   4. Welded Construction: Comply with AWS D1.2/D1.2M for procedures, appearance, and quality of welds, and methods used in correcting defective welding Work.

C. Bracing:
   1. Bracing for which stress is not shown or indicated shall have minimum two-bolt connection, or shop-welded connection of equivalent strength.
   2. Vertical bracing and knee braces connecting to columns shall be on the centerline of columns, unless otherwise shown or indicated.
   3. Knee braces shall be at 45-degree angle, unless otherwise shown or indicated.
   4. Connection plates shall be minimum 3/8-inch thick, unless otherwise shown.

D. Columns: Fabrication tolerances shall be as required by AA ADM-1 and AWS D1.2/D1.2M for welded members.

E. Holes and Appurtenances for Other Work:
   1. Provide holes required for securing other work to structural aluminum framing, and for passage of other work through framing members, as shown on the Shop Drawings and the Contract Documents. If large block-outs are required and approved, reinforce the webs to develop specified shear

strength. Provide threaded nuts welded to framing, and other specialty items as shown to receive other work.

2. Cut, drill, or punch holes perpendicular to metal surfaces. Do not frame cut holes or enlarge holes by burning. Drill holes in bearing plates.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which structural aluminum Work will be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 ERECTION

A. Comply with AA ADM-1 and the Contract Documents.

B. Anchorage Devices:
   1. Provide anchorage devices, including anchor bolts, and other connectors required for securing structural aluminum to foundations and other in-place Work.
   2. Provide templates and other devices necessary for pre-setting anchorage devices to accurate locations.
   3. Refer to Section 05 05 33, Anchor Systems, for anchorage requirements.

C. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
   1. Set loose and attached base plates and bearing plates for structural members on stainless steel wedges or other adjusting devices.
   2. Tighten anchorage devices after positioning and plumbing supported members. Do not remove wedges or shims, but if protruding, cut off flush with edge of the base or bearing plate prior to packing with grout.
   3. Place non-shrink grout between bearing surfaces and bases or plates in accordance with Section 03 60 00, Grouting. Finish exposed surfaces, protect installed materials, and cure in compliance with grout manufacturer's instructions.
   4. Leveling plates and wood wedges are not allowed.

D. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure within tolerances specified in AA ADM-1. For members requiring accurate alignment,

provide clip angles, lintels and other members shall be with slotted holes for horizontal adjustment at least 3/8-inch in each direction, or more when required.

2. Splice members only where shown or indicated.

E. Erection Bolts: On exposed, welded construction, remove erection bolts, fill holes with plug welds, and grind smooth at exposed surfaces.

F. Gas Cutting: Do not use gas-cutting torches at the Site for correcting structural framing fabrication errors. Field-cutting will be allowed only on secondary members that are not under stress, as approved by ENGINEER. Finish gas-cut sections equal to sheared appearance when allowed.

G. Protection of Aluminum from Dissimilar Materials:
   1. Coat surfaces of aluminum that will contact dissimilar materials such as concrete, masonry, and steel, in accordance with Section 09 91 00, Painting.

3.3 FIELD QUALITY CONTROL

A. Engage an independent testing and inspection agency to inspect stainless steel bolted connections and welded connections as follows:
   1. Visually inspect all welds. Test wells that appear to be visually deficient using non-destructive methods by qualified testing laboratory. CONTRACTOR shall correct improper workmanship by removing and replacing, or repairing, as instructed by ENGINEER, welds that are defective. Pay for all corrections and subsequent retesting to confirm integrity of welds.
   2. Visually inspect all bolted connections.
      a. Visually inspect connections to verify that plies of connected elements are in snug contact.
      b. Where bolts or connections are defective, correct improper workmanship and materials by removing defective bolts and connections and replacing or repairing as directed by ENGINEER. Pay for corrections and subsequent tests required to confirm integrity of connection.
   3. Independent testing and inspection agency shall prepare a report on each structure. Report shall summarize observations made by inspector and be submitted to ENGINEER.

B. Correct defecctive structural aluminum Work. Perform additional tests, at CONTRACTOR'S expense, necessary to confirm non-compliance of the original Work and to demonstrate compliance of corrected Work.

+ + END OF SECTION + +

SECTION 05 31 23

STEEL ROOF DECKING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install galvanized steel roof decking.
   2. Steel roof decking Work shall include all incidentals required to complete the Work. The Work also includes:
      a. Cutting and flashing of openings to accommodate the Work under this and other Specification Sections, and providing for the steel roof decking all items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Specification Sections and coordinate the installation of items to be installed with or before steel roof decking Work.

C. Related Sections:
   1. Section 04 00 05 Masonry
   2. Section 07 21 05, Building Insulation.
   3. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AISI S100, North American Specification for the Design of Cold-Formed Steel Structural Members, with Supplements.
   2. ANSI/SDI RD1.0, Steel Roof Deck.
   3. ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   4. ASTM B633, Specification for Electrodeposited Coatings of Zinc on Iron and Steel
   5. ASTM C1513 Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
   6. ASTM F1941, Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))
   7. AWS D1.3/D1.3M, Structural Welding Code – Sheet Steel.
   8. ICC-ES AC43, Acceptance Criteria for Steel Deck Roof and Floor Systems.

9. ICC-ES AC70, Acceptance Criteria for Fasteners Power Driven Into Concrete, Steel, and Masonry Elements.
10. ICC-ES AC118, Acceptance Criteria for Tapping Screw Fasteners.
11. MIL-P-21035B, Paint, High Zinc Dust Content Galvanizing Repair.
12. SAE J78, Steel Self-Drilling Tapping Screws.
13. SDI MOC2, Manual of Construction with Steel Deck.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Manufacturer shall have not less than five years experience producing products substantially similar to those required and, upon ENGINEER's request, shall submit evidence of not less than five installations in satisfactory operation for not less than five years each.
   2. Erector:
      a. Engage an experienced erector to perform the Work of this Section who has specialized in erecting and installing steel roof decking similar to that required for the Project and who is acceptable to the steel roof decking manufacturer.
      b. Submit name and qualifications to ENGINEER, with the following information for not less than three successful, completed projects:
         1) Names and telephone numbers of owners, and architects or engineers responsible for each project.
         2) Approximate contract cost of the steel roof decking work.
         3) Area of roof decking installed.
   3. Welders and Welding Processes:
      a. Qualify welding processes and welding operators in accordance with AWS D1.3/D1.3M.
      b. Submit certification that each welder employed on or to be employed for the Work possesses current AWS certification in the welding process with which welder will be working. Certifications shall be current and valid throughout the Work.

B. Component Supply and Compatibility:
   1. Obtain all products required in this Section, regardless of component manufacturer, from a single steel roof decking manufacturer.
   2. Steel roof decking manufacturer shall prepare, or review and approve, all Shop Drawings and other submittals for components furnished under this Section.
   3. Components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by steel roof decking manufacturer.

C. Regulatory Requirements:
   1. Regulatory Requirements: Furnish and install metal deck in accordance with the manufacturer's current ICC Evaluation Service Report and UL listing requirements to obtain diaphragm values and fire ratings indicated.

2. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual System and are listed in "Factory Mutual Approval Guide" for "Class I" fire rated construction.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Erection drawings showing the extent of coverage of each section of metal deck. Show deck cross section, size and spacing of welds to supports, side laps, and end laps. Show adaptations around openings and other special conditions that detail the method of fastening sections to supporting construction, the procedure for attaching end closure plates and butt joint cover plates, miscellaneous flashing, and accessories.
      b. Listing of all mechanical fastener products proposed for use in the Work including product type, and intended location in the Work.
   2. Product Data:
      a. Manufacturer's catalogs, literature, specifications, load tables, and dimension diagrams for the following:
         1) Steel Deck and accessories; including load tables that indicate uniform load capacities and diaphragm shear strengths for the appropriate deck, span conditions, and fastening system. Include the section properties for the specified deck.
         2) Mechanical Fasteners: Including acceptable base material conditions and thickness ranges for each type of fastener, copies of valid ICC-ES reports that provide evaluation criteria, load carrying capacities and installation requirements.

B. Informational Submittals: Submit the following:
   1. Field Quality Control Submittals:
      a. Reports by testing laboratory in accordance with Paragraph 3.3 of this Section.
   2. Qualifications Statements: As specified in Paragraph 1.3.A of this Section for the following:
      a. Manufacturer, when requested by ENGINEER.
      b. Erector.
      c. Welders and welding processes.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. System Description:
   1. Provide steel roof decking systems at the locations shown on the Drawings.
   2. Deck configuration is indicated in Paragraph 2.3.A of this Section.

B. Design and Performance Criteria:
   1. Unless otherwise shown or indicated, material, design, fabrication and erection shall be in accordance with AISI S100 and ANSI/SDI RD1.0.
   2. Determine the properties of steel roof deck sections on the basis of the effective design width as limited by AISI S100. Provide not less than the deck section properties shown, including section modulus and moment of inertia per foot of width.
   3. Allowable Deflection: The lesser of the following: 1/240 of span (centerline to centerline), or one inch, under the uniformly-distributed design live load. Spans are to be considered center-to-center of supports.
   4. Allowable Diaphragm Shear Strength: Provide deck, fasteners and fastener layout that provide a shear strength that meets or exceeds the design shear strength shown or indicated.

2.2 MATERIALS

A. Galvanized Steel Sheet:
   1. Material: ASTM A653/A653M, structural steel, with yield strength of not less than 33 ksi.
   2. Zinc Coating shall be G60 on each side.
   3. Minimum nominal thickness before coating shall be 20-gage, unless otherwise indicated.

B. Deck shall have sheet lengths that are continuous over three or more spans, wherever practicable.

C. Accessories shall be formed of the same material used for the steel deck.

D. Miscellaneous Steel Shapes: Refer to Section 05 12 00, Structural Steel Framing.

E. Galvanizing Repair Paint: High zinc-dust content paint for repairing damaged galvanized surfaces. Paint shall be in accordance with MIL-P-21035B.

F. Flexible Closure Strips for Deck: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.

G. Mechanical Fasteners: Anchorage of the steel deck using mechanical fasteners, either powder actuated, pneumatically driven, or screws, will be allowed in lieu of welding, when the fasteners comply with the following:
   1. Design Requirements: Comply with ANSI/SDI RD1.0. Type and spacing of fastener shall be equal to or greater than the puddle weld method shown or specified. Documentation in the form of ICC-ES reports, test data, diaphragm design tables or design charts shall be submitted by the fastener manufacturer as a basis for obtaining approval for this method of attachment.
   2. Powder-Actuated and Pneumatic Fasteners:

a. Fasteners shall have a current evaluation report by ICC-ES for use in fastening metal deck to steel substrate, as tested and assessed in accordance with ICC-ES AC43, and ICC-ES AC70.
b. Products and Manufacturers: Provide one of the following.
   1) X-ENP-19 L15, X-END19 THQ 12, X-ENDK22 THQ 12 Powder Actuated Fasteners, by Hilti, Inc.
   2) K65056, K65062, SD65075, K64062, SDK63075 Air/Safe Fastening System, by Pneutek.
   3) Or equal.
c. Substrate: Do not use powder-actuated or pneumatically-driven fasteners if supporting structural steel substrate is less than 1/8-inch thick.
d. Material: Hardened carbon steel.
e. Hardness: Minimum 52 Rockwell.
f. Shape and Manufacturing Process: Knurled shank, forged point. Manufacturing process shall include steps to ensure fastener ductility and quality.
g. Shank Diameter: 0.145-inch minimum.
h. Head/Washer Diameter: Nominal 1/2-inch minimum.
i. Finish: Zinc-coated complying with ASTM B633, Sc. 1, Type III.

3. Self-Drilling Self Tapping Screws:
   a. Fasteners shall have a current evaluation report by ICC-ES for use in fastening metal deck side laps, as tested and assessed in accordance with ICC-ES AC43 and ICC-ES AC118.
   b. Products and Manufacturers: Provide one of the following.
      1) S-SLC 01 M HWH, S-SLC 02 M HWH Side Lap Connectors, by Hilti, Inc.
      2) Grabber Self Drilling Screws, by John Wagner Associates, Inc.
      3) Or equal.
   c. Manufacture screws from heat-treated steel wire. Comply with SAE J78 and ASTM C1513.
   d. Substrate: Do not use screw fasteners if the supporting structural steel substrate is greater than 1/8 inch thick.
   e. Material: Carbon steel.
   f. Size: Provide number 10 screws for deck gages 22 thru 26, number 12 screws for thicknesses greater than 22 gage.
   g. Finish: Zinc-coated in accordance with ASTM F1941.

2.3 FABRICATION

A. General:
   1. Form deck units in lengths to span three or more supports with flush, telescoped or nested two-inch end laps and nesting side laps, unless otherwise shown. Provide deck configurations complying with SDI MOC2, and as specified in this Section.

B. Wide-Rib Deck:

1. Depth: Approximately 1.5 inches; ribs spaced approximately six inches on centers; width of rib opening at roof surface not more than 2.5 inches; width of bottom rib surface not less than 1.75 inches.
2. Products and Manufacturers: Provide one of the following:
    a. Type B Roof Deck, by Vulcraft, a Division of Nucor Corporation.
    b. Type B Roof Deck, by Metal Deck Group, a Division of Consolidated Systems, Inc.
    c. Type B Roof Deck, by DACS, Inc.
    d. Or equal.

C. Intermediate-Rib Deck:
1. Depth: Approximately 1.5 inches; ribs spaced approximately six inches on centers; width of rib opening at roof surface not more than 1.75 inches; width of bottom rib surface not less than 1/2-inch.
2. Products and Manufacturers: Provide one of the following:
    a. Type F Roof Deck, by Vulcraft, a Division of Nucor Corporation.
    b. Type F Roof Deck, by Metal Deck Group, a Division of Consolidated Systems, Inc.
    c. Type F Roof Deck, by DACS, Inc.
    d. Or equal.

D. Roof Sump Pans:
1. Fabricate each from one piece galvanized sheet steel, not less than 14-gage thickness, of the same quality as deck units, with level bottoms and sloping sides to direct water flow to drain, unless otherwise shown.
2. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than three inches wide.
3. Recess pans not less than 1.5 inches below roof deck surface, unless otherwise shown or required by deck configuration.
4. Holes for drains shall be cut in the field.

E. Cant Strips:
1. Fabricate cant strips of galvanized sheet steel, not less than 20-gage thickness, of the same quality as the deck units.
2. Bend cant strips to form a 45-degree cant not less than five inches wide, with top and bottom flanges not less than two inches wide, unless otherwise shown.
3. Provide cant strips in ten-foot lengths, where possible.

F. Ridge and Valley Plates:
1. Fabricate ridge and valley plates of galvanized sheet steel, not less than 20-gage thickness, of the same quality as the deck units; each leg not less than 2.25 inches wide, bent to provide tight-fitting closure with deck units.
2. Provide plates in ten-foot lengths, where possible.

G. Steel Filler and Closure Strips:
   1. Fabricate steel closure strips of galvanized sheet steel, not less than 20-gage thickness, of same quality as the deck units.
   2. Form to the configuration required to provide tight-fitting closures at open ends and sides of decking.

L. Venting:
   1. To ensure positive venting from the underside, provide factory-slotted or perforated steel roof deck to receive insulation system. Coordinate venting requirements with insulating material manufacturer.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work will be performed and notify ENGINEER in writing of unsatisfactory conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
   1. Install roof deck units and accessories in accordance with manufacturer's recommendations, and approved Shop Drawings and other approved submittals, and in accordance with the Contract Documents.
   2. Install deck in a continuous operation to avoid delaying the construction.

B. Placing Roof Deck Units:
   1. Place roof deck units on supporting steel framework and adjust to final position with ends bearing on supporting members and accurately aligned end to end before permanently fastening. Lap ends not less than two inches. Do not stretch or contract the side-lap interlocks. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.
      a. Do not place deck units on concrete or masonry supporting structure until concrete or masonry has cured properly and is dry.
   2. Form deck sheet at longitudinal sides in such manner that sides will overlap and interlock, and preclude the possibility of the dripping of cement paste from the concrete placed on it. End laps shall occur over bearings only.
   3. Coordinate and cooperate with structural steel erector in locating deck bundles to prevent overloading of structural members
   4. Do not use deck units for storage or working platforms until permanently secured.
   5. Steel deck shall provide a continuous uniform slope, with practically flush top surfaces, and shall be installed in straight and continuous rows, as far as practicable, with ribs at right angles to the supporting members.

6. Erect and properly align deck prior to fastening deck to supporting steel.

C. Fastening Deck Units: Fasten steel deck units to steel framework by the arc-welding process or with approved mechanical fasteners.
   1. Welding:
      a. Welds shall be free of sharp points and edges. Clean welds immediately, by chipping or wire brushing, and coat welds with zinc dust type primer paint.
      b. Welding shall be performed by qualified welders in accordance with AWS D1.3.
      c. Weld deck units to the steel supporting members using the welding pattern shown.
      d. Weld deck units to the steel supporting members by 5/8-inch diameter fusion area puddle welds at each deck rib, unless otherwise shown.
      e. Weld deck units to parallel framing supports with 5/8-inch diameter fusion area puddle welds at 12 inches on centers, unless otherwise shown.
      f. Weld deck units at sidelaps with 5/8-inch diameter fusion area puddle welds at mid-span, unless otherwise shown.
      g. Weld deck units to perimeter edge supports with 5/8-inch diameter fusion area puddle welds at 12 inches on centers, unless otherwise shown.
      h. Weld connection angles and plates to supporting members and deck with 5/8-inch diameter fusion welds at 12 inches on centers, unless otherwise shown.
      i. Before insulation is installed, replace welds found to be defective.
   2. Mechanical Fastening:
      a. Comply with manufacturer's requirements for installation procedures for mechanical fastener attachment methods.
      b. Fasten deck units to the steel supporting members using the fastener pattern shown.
      c. Fasten deck units to the steel supporting members with specified fasteners at each deck rib, unless otherwise shown.
      d. Fasten deck units to parallel framing supports with specified fasteners at 12 inches on centers, unless otherwise shown.
      e. Fasten deck units at sidelaps with specified self-drilling screws at 12 inches on centers, unless otherwise shown.
      f. Fasten deck units to perimeter edge supports with specified fasteners at 12 inches on centers, unless otherwise shown.
      g. Fasten connection angles and plates to supporting members and deck with specified fasteners at 12 inches on centers, unless otherwise shown.
      h. Before insulation is installed, replace all fasteners found to be defective.

D. Cutting and Fitting:
   1. Cut and fit roof deck units and accessories around other work projecting through or adjacent to the roof deck. Provide neat, square and trim cuts.

E. Reinforcing at Openings:
   1. Provide additional steel reinforcing and closure pieces as required for strength, continuity of deck, and to support other work, unless otherwise shown.
   2. Reinforce roof deck around openings less than 15 inches in any dimension by means of a flat steel sheet placed over the opening and fastened to the top surface of deck. Provide steel sheet of the same quality as deck units, not less than 20-gage thickness, and not less than 12 inches wider and 12 inches longer than the opening. Provide welds or mechanical fasteners at each corner and spaced not more than 12 inches on centers along each side.

F. Roof Sump Pans:
   1. Place roof sump pans over openings provided in the roof deck and fasten to the top deck surface. Space fasteners or welds not more than 12 inches on centers with at least one attachment at each corner. Cut opening in the bottom of roof sump to accommodate drain size shown.

G. Cant Strips:
   1. Fasten cant strips to the top surface of roof deck, and secure to wood nailers with galvanized steel screws, and to steel framing with welds or galvanized steel self-tapping screws. Space fasteners or welds at 12 inches on centers and lap end joints not less than three inches and secure with galvanized steel sheet metal screws.

H. Ridge and Valley Plates:
   1. Fasten ridge and valley plates to the top surface of roof deck with welds or self-drilling screws. Lap end joints not less than three inches, with laps made in the direction of water flow.

I. Closure Strips:
   1. Provide steel closure strips at open uncovered ends and edges of roof deck, and in the voids between deck and other construction. Fasten into position to provide a complete deck installation.
      a. Provide flexible closure strips, instead of steel closures, at CONTRACTOR's option, wherever such use will ensure complete closure. Install with adhesive in accordance with manufacturer’s instructions.

J. Roof Insulation Support:
   1. Provide steel closure strips for supporting roof insulation where rib openings in the top surface of roof deck occur adjacent to edges and openings. Fasten closure strips into position.

K. Touch-up Painting:
   1. After completion of roof deck installation, wire-brush clean and paint scarred and damaged areas, welds, and rust spots on supporting steel members in accordance with Section 09 91 00, Painting.

2. Touch-up galvanized top and bottom surfaces of deck units with galvanizing repair paint applied in accordance with the paint manufacturer's instructions and recommendations.

3.3 FIELD QUALITY CONTROL

A. Furnish services of independent testing laboratory to inspect welded connections and to perform tests and prepare test reports.
   1. All welds will be subject to visual inspection. Where visually deficient welds are observed, welds will be tested using non-destructive methods by certified testing laboratory. If welds are found to be satisfactory, OWNER will pay for testing. Where welds are found unacceptable or deficient, CONTRACTOR will pay for testing. CONTRACTOR shall correct improper workmanship, remove and replace, or correct as instructed, welds found unacceptable or deficient. CONTRACTOR shall pay for corrections and subsequent tests required to confirm the integrity of the weld.
   2. Correct deficiencies in steel roof deck Work that inspection and laboratory test reports indicate do not comply with the Contract Documents. Perform additional tests as required to confirm non-compliance of the original Work, and as may be necessary to demonstrate compliance of corrected Work.
   3. Work not in compliance with the Contract Documents and, where the Contract Documents do not include detailed requirements, Work that is not in accordance with generally-accepted standards of the trade, will be deemed defective. All Work that is defective shall be corrected or replaced as directed by ENGINEER. Corrections, re-design, and replacement of defective Work shall be at CONTRACTOR's expense

+ + END OF SECTION + +

SECTION 05 40 00

COLD-FORMED METAL TRUSS AND FRAMING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install pre-engineered, pre-fabricated cold-formed steel framing elements.
   2. The Work includes the following:
      a. Cold-formed steel roof trusses.
      b. Anchorage, bracing, framing, and bridging.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before anchor systems Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic and nonmetallic-Coated for Cold-Formed Framing Members.
   2. ASTM A780-93a - Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
   3. AWS D1.1 - Structural Welding Code – Steel.
   4. AWS D1.3 - Structural Welding Code - Sheet Steel.
   5. American Iron and Steel Institute - North American Specification for the Design of Cold-Formed Steel Structural Members, 2012 – AISI S100-2012.
   6. American Iron and Steel Institute - Standard for Cold-Formed Steel Framing AISI S240-15.
   7. Structural Building Components Association - Cold-Formed Steel Building Component Safety Information (CFSBCSI).

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Fabricator Qualifications: Fabrication shall be performed in a quality-controlled manufacturing environment by a cold-formed steel truss fabricator with experience fabricating cold-formed steel trusses equal in material, design, and scope to the trusses required for this Project.
      a. Installation of cold-formed steel truss roof assembly shall be performed by an installer with experience installing cold-formed steel

trusses equal in material, design and scope to the trusses required for this Project.

2. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
   a. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Decking plan, deck profile dimensions, supports, projections, openings and reinforcements, fastening method and installation accessories.
      b. Roof truss layouts indicating placement of trusses.
      c. Secondary framing to support finishes, lighting, HVAC units, etc.
      d. Locations, types, and sequence of connections.
      e. Welds by standard welding symbols adopted by AWS.
      f. Provide design calculations and Shop drawings signed and sealed by Professional Structural Engineer registered in the state of New York.
   2. Product Data:
      a. Submit manufacturer's product data and installation instructions for each type of cold-formed steel framing and accessory required.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery
   1. Deliver materials in manufacturer's unopened containers or bundles, fully identified by name, brand, type and grade. Exercise care to avoid damage during unloading, storing and erection.

A. Storage and Protection:
   1. Store trusses on blocking, pallets, platforms or other supports off the ground and in an upright position sufficiently braced to avoid damage from excessive bending.
   2. Protect trusses and accessories from corrosion, deformation, damage and deterioration when stored at job site. Keep trusses free of dirt and other foreign matter.

1.6 PROJECT CONDITIONS

A. During construction, adequately distribute all loads applied to trusses so as not to exceed the carrying capacity of any one truss.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. AISI "Specifications": Calculate structural characteristics of cold-formed steel truss members according to American Iron and Steel Institute "North American Specification for the Design of Cold-Formed Steel Structural Members, 2012 – AISI S100-2012.

B. Structural Performance: Design, fabricate, and erect cold-formed steel trusses to withstand specified design loads within limits and under conditions required:
   1. Design Loads: As specified.
   2. Deflections: Live load deflection meeting the following (unless otherwise specified):
      a. Roof Trusses: Vertical deflection less than Engineer approved equal to Length/240.

2.2 MANUFACTURERS:

A. Manufacturer: Supplier will be selected based on project proximity.

2.3 COMPONENTS

A. System components: Cold-formed steel roof truss components.

B. Provide manufacturer's standard steel truss members, bracing, bridging, blocking, reinforcements, fasteners and accessories with each type of steel framing required, as recommended by the manufacturer for the applications indicated and as needed to provide a complete cold-formed steel truss roof or floor assembly.

2.4 MATERIALS

A. For all chord and web members: Fabricate components of structural quality steel sheet per ASTM A1003 with a minimum yield strength of 50,000 psi.

B. Bracing, bridging and blocking members: Fabricate components of commercial quality steel sheet per ASTM A1003 with a minimum yield strength of 33,000 psi.

C. Steel truss components: Provide sizes, shapes and material thickness indicated.
   1. Design Uncoated-Steel Thickness: 0.0350 inch (0.89 mm).
   2. Design Uncoated-Steel Thickness: 0.0460 inch (1.17 mm).
   3. Design Uncoated-Steel Thickness: 0.0570 inch (1.45 mm)
   4. Design Uncoated-Steel Thickness: 0.0730 inch (1.85 mm)
   5. Design Uncoated-Steel Thickness: 0.0970 inch (2.46 mm).

D. Finish: Provide components with protective zinc coating complying with ASTM A1003, minimum G60 coating.

E. Fastenings:
   1. Manufacturer recommended self-drilling screws with corrosion-resistant plated finish. Fasteners shall be of sufficient size and number to ensure the strength of the connection.
   2. Welding: Comply with AWS D1.1 when applicable and AWS D1.3 for welding base metals less than 1/8" thick.
   3. Other fasteners as accepted by truss engineer.

2.5 FABRICATION

A. Factory fabricate cold-formed steel trusses plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
   1. Fabricate truss assemblies in jig templates.
   2. Cut truss members by sawing or shearing or plasma cutting.
   3. Fasten cold-formed steel truss members by screw fastening, or other methods as standard with fabricator.

B. Locate mechanical fasteners and install according to cold-formed steel truss component manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads. Care shall be taken during handling, delivery and erection. Brace, block, or reinforce the truss as necessary to minimize member and connection stresses. Refer to SBCA - CFSBCSI

C. Fabrication Tolerances:
   1. Overall Length: Fabricate each cold-formed steel truss to the maximum allowable tolerance as follows:
      a. Truss length up to 30 ft – ½" tolerance.
      b. Truss length over 30 ft – ¾" tolerance.
   2. Overall Height: Fabricate each cold-formed steel truss to the maximum allowable tolerance as follows:
      a. Truss height up to 5 ft – ¼" tolerance.
      b. Truss height over 5 ft – ½" tolerance.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine structure, substrates and installation conditions. Do not proceed with cold-formed steel truss installation until unsatisfactory conditions have been corrected.

B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.2 INSTALLATION

A. General:
   1. Erection of trusses, including proper handling, safety precautions, installation bracing and other safeguards or procedures is the responsibility of the CONTRACTOR and CONTRACTOR's installer. Refer to SBCA – CFSBCSI or contact qualified registered Professional Engineer.
   2. Exercise care and provide installation bracing required to prevent collapse of trusses during erection and prior to installing permanent bracing system.
   3. Erect and install trusses in accordance with the sealed Drawings.
   4. Space trusses in accordance with the sealed Drawings.
   5. Install all continuous bridging and permanent truss bracing in accordance with the seale Drawings.
   6. Perform all truss to truss connections in accordance with the sealed Drawings.
   7. Erect trusses without damaging truss members or connections.

B. Erect trusses with plane of truss webs vertical and parallel to each other, accurately located at design spacing indicated.

C. Provide proper lifting equipment, including spreader bar, suited to sizes and types of trusses required, applied at lift points recommended by truss fabricator. Exercise care to avoid damage to truss members during erection and to keep horizontal bending of the trusses to a minimum.

D. Provide framing anchors as indicated or accepted on the engineering design drawing or erection drawings. Anchor trusses securely at bearing points.

E. Install trusses plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations.
   1. DO NOT cut truss members without prior approval of truss engineer.
   2. Fasten cold-formed steel trusses to supports by screw fastening, welding or other methods, as standard with fabricator.
      a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to cold-formed truss manufacturer's instructions with screw penetrating joined members by not less than three exposed screw threads
   3. Install trusses in one-piece lengths, unless splice connections are indicated.
   4. Provide installation bracing and leave in place until trusses are permanently braced/restrained.

F. Erection Tolerances
   1. Limit overall bow or bow in any chord member to the lesser of L/200 or 2 inches. L equal to length of truss or member.
   2. Limit out-of-plane plumb to the lesser of L/50 or 2 inches. L equal to the height of the truss.

3. Space individual trusses no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 ADJUSTING AND CLEAN UP

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanizing repair paint according to ASTM A780 and the manufacturer's instructions.

+ + END OF SECTION + +

SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish miscellaneous metal fabrications including surface preparation and shop priming.
   2. The Work also includes:
      a. Providing openings in miscellaneous metal fabrications to accom-modate the Work under this and other Sections, and attaching to miscellaneous metal fabrications all items such as sleeves, bands, studs, fasteners, and all items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the Work to be installed with, or attached to miscellaneous metal fabrications Work.
   2. Hot-dip Galvanizing: Coordinate with steel fabricator detailing for and fabrication of assemblies to be hot-dip galvanized, to minimize distortion during galvanizing process.

C. Related Sections:
   1. Section 03 60 00, Grouting.
   2. Section 05 05 33, Anchor Systems.
   3. Section 05 52 15, Aluminum Handrails and Railings.
   4. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI A14.3, Ladders – Fixed –Safety Requirements.
   2. ANSI Z359.1, Safety Requirements for Personal Fall Arrest Systems, Subsystems, and Components.
   3. ASTM A36/A36M, Specification for Carbon Structural Steel.
   4. ASTM A53/A53M, Specification for Pipe Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   5. ASTM A123/A123M, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   6. ASTM A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

7. ASTM A240/A240M, Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.
8. ASTM A320/A320M, Specification for Alloy-Steel and Stainless Steel Bolting Materials for Low-Temperature Service.
9. ASTM A384/A384M-02 Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
10. ASTM A500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
11. ASTM A572/A572M, Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
12. ASTM A793, Specification for Rolled Floor Plate, Stainless Steel.
13. ASTM A992/A992M, Specification for Structural Steel Shapes.
14. ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
15. ASTM B211, Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire.
16. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
17. ASTM B308/B308M, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
18. ASTM B429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
19. ASTM B632/B632M, Specification for Aluminum-Alloy Rolled Tread Plate.
20. AWS D1.1/D1.1M, Structural Welding Code – Steel.
21. AWS D1.2/D1.2M, Structural Welding Code – Aluminum.
22. AWS D1.6, Structural Welding Code – Stainless Steel.
23. NAAMM, Metal Finishes Manual.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Welding:
      a. Qualify welding processes and welding operators in accordance with AWS D1.1/D1.1M, D1.2/D1.2M, or D1.6, as applicable.
      b. When requested by Engineer, provide certification that each welder employed on or to be employed for the Work have satisfactorily passed AWS qualification tests within previous 12 months. Ensure that all certifications are current.

B. Regulatory Requirements: Conform to the following:
   1. 29 CFR 1910, Occupational Health and Safety Standards.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:

a. Fabrication and erection details for assemblies of miscellaneous metal Work. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items. Include setting drawings and templates for locating and installing miscellaneous metal items and anchorage devices.

2. Product Data:
   a. Copies of manufacturer's specifications, load tables, dimension diagrams, anchor details, and installation instructions for products to be used in miscellaneous metal Work.

B. Informational Submittals: Submit the following:
   1. Test and Evaluation Reports:
      a. Mill test report that indicate chemical and physical properties of each type of material, when requested by Engineer.
   2. Qualifications Statements:
      a. Copies of welder's certifications, when requested by Engineer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver products to Site to ensure uninterrupted progress of the Work. Deliver anchorage materials to be embedded in other construction in ample time to prevent delaying the Work.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Steel:
   1. W-Shapes and WT-Shapes: ASTM A992/A992M.
   2. S-Shapes and Channels: ASTM A572/A572M, Grade 50.
   3. Hollow Structural Sections: ASTM A500, Grade B.
   4. Angles, Plates, Bars: ASTM A36/A36M.
   5. Steel Pipe: ASTM A53/A53M, Grade B.

B. Aluminum:
   1. Aluminum Shapes: ASTM B308/B308M, Alloy 6061-T6, ASTM B 221, Alloy 6061-T6.
   2. Aluminum Tubes and Pipes: ASTM B429, Alloy 6061-T6.
   3. Aluminum Bars and Rod: ASTM B211, Alloy 6061-T6.
   4. Aluminum Plates: ASTM B209, Alloy 6061-T6.

C. Stainless Steel:
   1. Plates and Sheets: ASTM A240/A240M, Type 304L or Type 316 stainless steel.
   2. Submerged or Intermittently Submerged: Type 316 stainless steel.
   3. Non-submerged: Type 304L stainless steel.

D. Stainless Steel Fasteners and Fittings: ASTM A 320/A 320M, Type 304L or Type 316 Stainless Steel.

E. Zinc-coated Hardware: ASTM A153/A153M.

2.2 MISCELLANEOUS METAL ITEMS

A. Shop Assembly:
   1. Pre-assemble items in the shop to the greatest extent possible to minimize field-splicing and field-assembly of units at the Site. Disassemble units only to extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Stainless Steel Ladders:
   1. Fabricate ladders for locations shown or indicated with dimensions, spacing, details, and anchorages as shown and specified. Comply with OSHA 29 CFR 1910 and ANSI A14.3, except as otherwise shown or specified.
      a. Unless otherwise shown, provide 1.5-inch diameter continuous side rails, spaced at least 1.5 feet apart.
      b. Provide extruded square rungs, spaced maximum of 12 inches on centers, with non-slip surface on top of each rung. Adhesive strips for non-slip surfaces are not acceptable.
   2. Fit rungs in centerline of side rails, plug weld, and grind smooth on outer rail faces.
   3. Support each ladder at top and bottom and at intermediate points spaced not more than five feet on centers.
   4. Use welded or bolted brackets, designed for adequate support and anchorage, and to hold ladder clear of wall surface with minimum of seven inches between wall and centerline of rungs.
   5. Unless otherwise shown or approved by Engineer, extend rails 3.5 feet above top rung, and return rails to wall or structure, unless other secure handholds are provided. If adjacent structure does not extend above top rung, goose-neck extended rails back to structure to provide secure ladder access.
   6. Ladders shall be fabricated from Type 316 stainless steel.

C. Steel Lintels:
   1. Provide loose structural steel lintels for openings and recesses in masonry walls and brick walls as specified or as shown.
   2. Weld adjoining members together to form a single unit, where shown or indicated.
   3. Provide not less than eight inches bearing at each side of openings, unless otherwise shown.
   4. Steel lintels to be installed in exterior walls shall be hot-dip galvanized and finish painted. Other steel lintels shall be painted.
   5. Surface preparation and painting shall conform to Section 09 91 00, Painting.

D. Aluminum Stair Nosings:
   1. Manufacturers: Provide products of one of the following:
      a. Supergrit Type 241BF by Wooster Products, Inc.
      b. Or equal.
   2. Fabricate extruded aluminum nosing of sizes and configurations as shown on the Drawings.
      a. Unless otherwise shown, provide ribbed abrasive filled type, using black abrasive filler.
   3. Provide anchors for embedding in concrete, either integral or applied to treads, as standard with manufacturer.

E. Safety Post:
   1. Provide safety post for each fixed access ladder located below an access hatch. Safety post shall be manufactured of high-strength structural material with telescoping tubular section that locks automatically when fully extended.
   2. Products and Manufacturers: Provide products of one of the following:
      a. LadderUP Safety Post by Bilco Company
      b. Or equal.
   3. Use upward and downward movement of post shall be controlled by stainless steel spring balancing mechanism.
   4. Safety post shall be Type 304 stainless steel.

F. Stainless Steel Bar Racks and Rakes:
   1. Provide manually cleaned bar racks as shown on the Drawings.
   2. Fabricate of all Type 316L stainless steel welded construction in accordance with details on the Drawings.
   3. Bar size and spacing shall provide clear openings as shown on the Drawings.
   4. Provide plates, angles, bars, and fasteners as shown on the Drawings.
   5. Provide approved rake of suitable length and spacing to match rack dimensions.

G. Bollards:
   1. Provide Schedule 40 galvanized steel pipe filled with concrete as shown on the Drawings. Paint as required in accordance with Section 09 91 00, Painting. Unless otherwise shown or specified, finish-paint bollard “Safety Yellow.”

H. Miscellaneous Framing and Supports:
   1. Provide miscellaneous metal framing and supports that are not part of structural steel framework and are required to complete the Work.
   2. Fabricate miscellaneous units to sizes, shapes, and profiles shown on the Drawings or, if not shown, of required dimensions to receive adjacent grating, plates, tanks, doors, and other work to be retained by the framing.
   3. Except as otherwise shown, fabricate from structural shapes, plates, and bars, of all-welded construction using mitered corners, welded brackets, and splice plates and minimum number of joints for field connection.
   4. Cut, drill, and tap units to receive hardware and similar items to be anchored to the Work.

5. Furnish units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units are to be installed after concrete is placed.
    a. Except as otherwise shown, space anchors, 2.0 feet on centers, and provide units the equivalent of 1.25-inch by 1/4-inch by eight-inch strips.
    b. Galvanize exterior miscellaneous frames and supports.
    c. Where shown or indicated, galvanize miscellaneous frames and supports that are not to be installed outdoors.
6. Miscellaneous steel framing and supports shall be hot-dip galvanized and finish-painted, unless otherwise shown or indicated.
7. For railings, refer to Section 05 52 15, Aluminum Handrails and Railing.
8. Surface preparation and painting of galvanized surface shall conform to Section 09 91 00, Painting

I. Fasteners and Hardware: Provide Type 316 stainless steel fasteners for aluminum fabrications and zinc-coated hardware for galvanized fabrications, unless otherwise shown or specified.

J. Anchors and Expansion Anchors: Refer to Section 05 05 33, Anchor Systems.

2.3 FINISHING

A. Galvanizing:
    1. Galvanizing of fabricated steel items shall comply with ASTM A123/A123M.
    2. Details of fabrication of steel items and assemblies to be hot-dip galvanized shall conform to recommendations of ASTM A384/A384M to minimize the potential for distortion.

B. Aluminum Finish: Provide natural mill finish for aluminum Work unless otherwise shown or specified.

2.4 SOURCE QUALITY CONTROL

A. Tests and Inspections:
    1. Materials and fabrication procedures shall be subject to inspection and tests in the mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests will not relieve Contractor of responsibility for providing materials and fabrication procedures complying with the Contract Documents.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions under which the Work is to be performed and notify Engineer in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install miscellaneous metal fabrications accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels. Brace temporarily or anchor temporarily in formwork where fabrications are to be built into concrete, masonry, or other construction.

B. Anchor securely as shown and as required for the intended use, using concealed anchors where possible.

C. Fit exposed connections accurately together to form tight, hairline joints. Field-weld steel connections that are not to be exposed joints and cannot be shop-welded because of shipping size limitations. Comply with AWS D1.1/D1.1M, D1.2/D1.2M and D1.6, as applicable to the material being welded. Grind steel joints smooth and touch-up shop paint coat. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

D. Protection of Aluminum from Dissimilar Materials:
   1. Coat surfaces of aluminum that will contact dissimilar materials such as concrete, masonry, and steel, in accordance with Section 09 91 00, Painting.

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SECTION 05 51 17

ALUMINUM STAIRS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to design, furnish and install aluminum stairs including surface preparation and shop priming.
   2. The extent of aluminum stairs shall be as shown.
   3. The Work also includes:
      a. Providing openings in and attachments to aluminum stairs to accommodate the Work under this and other Sections and providing for the aluminum stairs all items such as anchor bolts, studs and all items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the aluminum stairs Work.

C. Related Sections:
   1. Section 05 52 15, Aluminum Handrails and Railings.
   2. Section 05 53 16, Aluminum Grating.
   3. Section 09 91 00, Painting. (Specification for surface preparation and shop priming is under Section 09 91 00, Painting.)

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. Aluminum Association (AA), Specification for Aluminum Structures.
   2. American Society for Testing and Materials, (ASTM).
      a. ASTM B 209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
      b. ASTM B 211, Specification for Aluminum and Aluminum-Alloy Bar, Rod and Wire.
      c. ASTM B 221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
      d. ASTM B 308/B 308M, Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
      e. ASTM B 429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

f. ASTM F 593, Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
g. ASTM F 594, Specification for Stainless Steel Nuts.

3. American Welding Society, (AWS).
   a. AWS D1.2/D1.2M, Structural Welding Code-Aluminum.
4. National Association of Architectural Metal Manufacturers, (NAAMM).
   a. NAAMM, Metal Stairs Manual and Metal Finishes Manual.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five years-experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all products included in this Section regardless of the component manufacturer from a single pre-engineered aluminum stair manufacturer.
   2. The pre-engineered aluminum stair manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the pre-engineered aluminum stair manufacturer.

C. Codes: Comply with the applicable requirements of the state and local building codes.

D. Source Quality Control: CONTRACTOR shall be responsible for entire design, fabrication, and installation of pre-engineered aluminum stair Work.

E. The Shop Drawings and calculations shall be prepared by a Registered Professional Engineer licensed in the State in which the pre-engineered aluminum stairs will be installed and is a recognized expert in the type of Work shown and specified.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Samples:
      a. Representative samples of materials including nosings, tread material, and other items as requested by the ENGINEER. Review will be for type only. Compliance with all other requirements is exclusive responsibility of CONTRACTOR.
   2. Shop Drawings:
      a. Erection and detailed Shop Drawings, which show the plan location, elevation and details for the fabrication and erection of the aluminum stair Work. Show anchorage and accessory items. Include details of all connections between all materials.

3. Delegated Design Submittals:
    a. Provide signed and sealed Shop Drawings and calculations, which are prepared by a Registered Professional Engineer licensed in the State in which the aluminum stairs will be installed.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
    1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.

B. Storage and Protection:
    1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect materials from corrosion and deterioration.

C. Acceptance at Site:
    1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. Pre-engineered aluminum stairs shall comply with the requirements of the NAAMM, "Metal Stairs Manual".

B. Sizes of miscellaneous items such as carrier angles and platform stiffeners, and design stresses shall be as recommended in Section 4 of the "Metal Stairs Manual", unless otherwise shown.

C. All required stair loadings and other stair related requirements shall comply with the governing building code in which the pre-engineered aluminum stairs will be installed.

2.2 FABRICATION

A. General:
    1. Use welding for joining pieces together, unless otherwise shown or specified. Welding to comply with the applicable provisions of AWS D1.2/D1.2M. Fabricate units so that bolts and other fastenings do not appear on finish surfaces. Make joints true and tight, and make connections between parts light-proof tight. Provide continuous welds, ground smooth where exposed.

2. Construct stair units to conform to sizes and arrangements as shown. Provide pre-engineered aluminum framing, hangers, columns, struts, clips, brackets, bearing plates and other components for the support of pre-engineered aluminum stairs and platforms. Erect pre-engineered aluminum stair Work to line, plumb, square, and true with runs registering level with floor and platform levels.
3. Provide brackets and bearing surfaces as detailed and as required to anchor and contain the pre-engineered aluminum stairs on the supporting structure.
4. Finish: Provide Architectural mill finish as specified in the NAAMM Manual.
5. Protection of Aluminum from Dissimilar Materials: Coat all surfaces of aluminum in contact with dissimilar materials, such as concrete, masonry and steel as specified in Section 09 91 00, Painting

B. Stair Framing:
1. Fabricate stringers of structural aluminum channels, or plates, or a combination thereof, as shown. Provide closures for exposed ends of stringers.
2. Construct platforms of structural aluminum channel headers and miscellaneous framing members, as shown. Bolt or weld headers to stringers. Bolt or weld framing members to strings and headers.

C. Aluminum Grating Treads and Platforms:
1. For aluminum grating and treads, refer to Section 05 53 16, Aluminum Grating.
2. Fabricate grating treads with abrasive nosing on one edge and with aluminum angle or aluminum plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
3. Fabricate grating platforms, with nosing matching that on grating treads, at all landings. Provide toe-plates at open-sided edges of floor grating fastened to platform framing members.
4. Provide platforms 3/8-inch minimum thick with solid abrasive surface matching that on treads. Secure platforms to platform framing members with bolts.

D. Stair Aluminum Railing:
1. Aluminum railings shall conform to the requirements of Section 05 52 15, Aluminum Handrails and Railings.

PART 3 – EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the conditions under which the Work is to be installed and notify the ENGINEER, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide concrete inserts, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction.

3.3 INSTALLATION

A. Fastening to In-Place Construction:
   1. Provide anchorage devices and fasteners where necessary for securing pre-engineered aluminum stairs to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through bolts and other connectors as required. The anchorage devices and fasteners shall be Type 316 stainless steel.

B. Cutting, Fitting and Placement:
   1. Perform cutting, drilling and fitting required for the installation of the pre-engineered aluminum stairs. Set the pre-engineered aluminum stairs accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry or similar construction.
   2. Fit exposed connections accurately together to form tight hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

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SECTION 05 52 15

ALUMINUM HANDRAILS AND RAILINGS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install aluminum handrail and railing systems. The Work also includes:
      a. Providing openings in, and attachments to, aluminum handrail and railing systems to accommodate the Work under this and other Specification Sections. Provide all items for aluminum handrails and railings, including anchorages, fasteners, studs, and other items required for which provision for is not specifically included under other Sections.
   2. Aluminum handrails and railings Work shall include components and features shown and specified, and all components and features available from specified manufacturers required for providing complete aluminum handrail and railing system in accordance with the Contract Documents.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before aluminum handrails and railings Work.
   2. Aluminum handrail and railing locations shall comply with Laws and Regulations.

C. Related Sections:
   1. Section 03 60 00, Grouting.
   2. Section 05 05 33, Anchor Systems.
   3. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AA, Aluminum Design Manual.
   2. ASTM B26/B26M, Specification for Aluminum-Alloy Sand Castings.
   3. ASTM B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
   4. ASTM B136, Standard Method for Measurement of Stain Resistance of Anodic Coatings on Aluminum.
   5. ASTM B137, Standard Test Method for Measurement of Coating Mass per Unit Area on Anodically Coated Aluminum.
   6. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.

7. ASTM B241/B241M, Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.
8. ASTM B244, Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments.
9. ASTM B247, Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and rolled Ring Forgings.
10. ASTM B429, Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
11. ASTM E 935, Standard Test Methods for Permanent Metal Railing Systems and Rails for Buildings.
12. NAAMM/Architectural Metal Products Division (AMP), Pipe Railing Manual.
13. NAAMM/AMP AMP 501 Finishes for Aluminum.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Upon request manufacturer shall submit document at least five years successful experience in fabricating aluminum handrail and railing systems of scope and type similar to that required.
   2. Professional Engineer:
      a. CONTRACTOR or handrail and railing manufacturer shall retain a registered professional engineer legally qualified to practice in same state as the Site. Professional engineer shall have at least five years-experience designing aluminum handrails and railings.
      b. Responsibilities include:
         1) Reviewing aluminum handrail and railing system performance and design criteria stated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER by CONTRACTOR.
         3) Preparing or supervising preparation of design calculations verifying compliance of aluminum handrail and railing system with requirements of the Contract Documents.
         4) Signing and sealing all calculations.
         5) Certifying that:
            a) Design of aluminum handrail and railing system was performed in accordance with performance and design criteria stated in the Contract Documents, and
            b) Design conforms to all applicable local, state, and federal Laws and Regulations, and to prevailing standards of practice.
   3. Installer:
      a. Retain a single installer trained and with record of successful experience in installing aluminum handrail and railing systems.
      b. Installer shall have record of successfully installing aluminum handrail and railing systems in accordance with recommendations and

requirements of manufacturer, or shall provide evidence of being acceptable to the manufacturer.

c. Installer shall employ only tradesmen with specific skill and successful experience in the type of Work required.

d. When requested by ENGINEER, submit name and qualifications of installer with the following information for at least three successful, completed projects:

1) Names and telephone numbers of owner and architect or engineer responsible for each project.

2) Approximate contract cost of the aluminum handrail and railing systems for which installer was responsible.

3) Amount (linear feet) of aluminum handrail and railing installed.

B. Component Supply and Compatibility:

1. Obtain all materials furnished under this Section regardless of component manufacturer, from a single aluminum handrail and railing system manufacturer.

2. Aluminum handrail and railing system manufacturer shall review and approve or prepare all Shop Drawings and other submittals (except for delegated design submittals, when professional engineer is retained by other than handrail and railing manufacturer) for all components furnished under this Section.

3. Components shall be specifically constructed for specified service conditions and shall be integrated into overall assembly by aluminum handrails and railings manufacturer.

C. Regulatory Requirements: Comply with Laws and Regulations including:

1. OSHA Part 1910.28, Duty to have fall protection and falling object protection.

2. OSHA Part 1910.29, Fall protection systems and falling object protection-criteria and practices.

D. Certifications:

1. Submit certification, signed by authorized officer of manufacturer and notarized, stating that handrail and railing systems comply with the design prepared by the professional engineer.

2. Submit certification, signed by authorized officer of CONTRACTOR and notarized, stating that all components and fittings are furnished by the same manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:

a. Drawings for fabrication and installation of aluminum handrail and railing systems with sizes of members, pipe wall thickness, information on components, and anchorage devices. Show all anchorages. Provide details drawn at scale of 1.5-inch equal to one foot.

b. Indicate required location of posts.

c. Indicate locations and details of all expansion joints, if any.

d. Indicate locations and details of gaps across seismic joints, if any.
e. Profile drawings of aluminum handrail and railing system components.
f. Custom detail drawings. Details of forming, jointing, sections, connections, internal supports, trim and accessories. Provide details drawn at scale of 1.5-inch equal to one foot.

2. Product Data:
   a. Manufacturer's specifications, standard detail drawings, and installation instructions for aluminum handrail and railing systems.
   b. Manufacturer's catalogs showing complete selection of standard and custom components and miscellaneous accessories for selection by ENGINEER.
3. Delegated Design Submittals:
   a. Design Data:
      1) Design computations or complete structural analysis of handrail and railing systems, signed and sealed by professional engineer. Professional engineer's seal shall be clearly legible, including state of registration, registration number, and name on seal.
      2) Certification by professional engineer that professional engineer has performed design of aluminum handrail and railing systems in accordance with performance and design criteria stated in the Contract Documents, and that design conforms to all local, state, and federal Laws and Regulations, and to prevailing standards of practice.
4. Samples:
   a. Full-size Sample, two feet long, of assembled railing system at post and rail intersections. Sample shall have all associated components including typical connections, mounted toeboard and sleeve, and handrail at wall return, complete with mounting brackets, all with specified controlled uniform metal finish.
   b. Color Samples: Maximum range of clear, anodized aluminum that shall appear in finished Work. Prepare range Samples, to show highest level of color control feasible for actual handrail and railing systems, as determined by licensor of finishing process specified, on actual extrusions and castings of the Work.
   c. ENGINEER will review Samples for finish, color, joint tolerances, workmanship, and general component assembly only. Compliance with other requirements is the responsibility of the CONTRACTOR.
5. Test Procedure: Submit detailed description of proposed shop testing procedures. Do not perform shop testing until ENGINEER approves shop test procedure:

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Certification on source of supply, as specified in Article 1.3 of this Section.
      b. Manufacturer certification specified in Article 1.3 of this Section.
   2. Source Quality Control Submittals:
      a. Manufacturer's load testing report in accordance with ASTM E935 for completed aluminum handrail and railing systems, demonstrating

compliance with applicable requirements of building codes, safety codes, and other Laws and Regulations.

3. Qualifications Statements: Submit qualifications for the following:
    a. Manufacturer, when requested by ENGINEER.
    b. Professional engineer.
    c. Installer, when requested by ENGINEER. Qualifications statement shall include record of experience with references specified.

C. Closeout Submittals: Submit the following:
1. Maintenance Manuals: Furnish detailed maintenance manuals that include the following:
    a. Product name and number.
    b. Detailed procedures for routine maintenance and cleaning, including cleaning materials, application methods and precautions in use of products that may be detrimental to finish when improperly applied.
    c. Handrail and railings systems manufacturer's current catalog including individual parts.
    d. Maintenance manuals shall be in accordance with Section 01 78 23, Operations and Maintenance Data.
2. Guarantee: Provide in maintenance manual the guarantee specified.

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection:
1. Keep products off ground using pallets, platforms, or other supports. Protect products from corrosion and deterioration.

B. Handling of Products:
1. Do not subject handrail and railing products to bending or stress.
2. Do not damage edges or handle products in a manner that will cause scratches, warping, or dents.
3. Protect handrails and railings by paper or coating as acceptable to handrail and railing manufacturer, against scratching, splashes of mortar, paint, and other marring during transportation, handling, and erection. Protect until completion of adjacent work.

1.6 GUARANTEE

A. Guarantee: Manufacturer shall provide written guarantee of availability of replacement parts and components for period of at least five years after completion of the Project.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. System Description: Aluminum handrail and railing system shall consist of equally spaced horizontal rails with totally concealed mechanical fasteners, internally threaded tubular rivets and components fastened to posts spaced no more than five feet on centers and system of handrails supported from adjacent construction by mounting brackets spaced at no more than five feet on centers.

B. Design Criteria and Performance Criteria:
   1. Design, fabricate, and install aluminum handrail and railing systems to withstand the most critical effects resulting from the following loads (loads listed below do not act concurrently):
      a. Uniform Load: 50 pounds per foot, applied at top in any direction.
      b. Concentrated Load: 200 pounds single load, applied at any point along the top in any direction.
      c. Components: Intermediate rails (all rails except the handrail), balusters, and panel fillers, if any, shall withstand horizontally-applied normal load of 50 pounds on an area equal to one square foot, including openings and space between rails. Reactions due to this loading are not required to be superimposed to loading specified for main supporting members of handrails and railings.
      d. Comply with AA Aluminum Design Manual for determining allowable stresses and safety factors for aluminum structural components.
      e. Limit deflection in each single span of railing and handrail to 1.5-inch maximum, and to 1/4-inch maximum on railing posts. Applied loads shall not produce permanent deflection in the completed Work when loads are removed.
   2. Thermal Control: Provide adequate expansion within fabricated systems that allows for thermal expansion and contraction caused by material temperature change of 140 degrees F to -20 degrees F without warp or bow of system components. Distance between expansion joints shall be based on providing 1/4-inch wide joint at 70 degrees F, which accommodates movement of 150 percent of calculated amount of movement for specified temperature range.
   3. Where handrail and railing systems cross expansion joints in the building or structure, provide expansion joints in handrail and railings systems.
   4. For posts located at or near end of runs as shown, uniformly space intermediate posts as required to conform to loading and deflection criteria specified, at intervals no greater than maximum post spacing specified. Where posts are shown for handrails along both sides of walkways and other similar locations, locate posts opposite each other; do not stagger post locations.

2.2 MANUFACTURERS

A. Products and Manufacturers: Provide one of the following:
   1. Custom Fabricated Connectorail System, by Julius Blum & Company, Inc.

2. Custom Fabricated Series 500 Non-Welded Aluminum Pipe Aluminum handrails and railing systems, by Superior Aluminum Products, Inc.
3. Or equal.

2.3 MATERIALS

A. Extruded Aluminum Architectural and Ornamental Shapes: ASTM B221, Alloy 6063-T52.

B. Aluminum Forgings: ASTM B247.

C. Extruded or Drawn Aluminum Pipe and Tube:
1. ASTM B429 or ASTM B241/B241M, Alloy 6063-T5, 6063-T52, or 6063-T832 as required by loadings, deflections, and post spacing specified.
2. Provide Schedule 40 pipe, minimum, unless conditions of detail and fabrication require extra-heavy pipe to comply with Specifications. Rails and posts shall have minimum outside diameter of 1.90 inches.

D. Reinforcing Bars: Solid, circular profile, two feet long, 6061-T6 aluminum reinforcing bars with same outside diameter as inside diameter of post.

E. Anchors and Fastenings:
1. For anchors and fasteners, use Type 316 stainless steel; minimum 3/8-inch diameter.
2. Provide minimum of four bolt fasteners per post where surface-mounted posts are shown. Components shall be in accordance with manufacturer's recommendations and as approved or accepted (as applicable) by ENGINEER on submittals.
3. Anchors: In accordance with Section 05 05 33, Anchor Systems.

F. Castings:
1. Provide high-strength aluminum alloy brackets, flanges, and fittings suitable for anodizing as specified.
2. Aluminum alloy sand castings: ASTM B26/B26M.

G. Connector Sleeves: Schedule 40, five-inch long by 1.610-inch diameter.

H. Sockets: Provide six-inch deep by 2.5-inch outside diameter aluminum sockets with 3.5-inch wide socket cover on bottom of each socket and on top and bottom of removable post sockets.

I. Gates: For each gate in handrail or railing system, provide the following:
1. Hinges: Two-self closing aluminum hinges.
2. Latches and Stops: One latch and stop with rubber bumper and one-inch diameter plastic knobs.

J. Custom Cover Flanges: 1/4-inch high by four-inch diameter, aluminum.

K. Adhesive: Two-part waterproof epoxy-type as recommended by handrail and railing systems manufacturer.

L. Non-shrink Grout: Comply with Section 03 60 00, Grouting.

M. Toeboards:
   1. Provide extruded Alloy 6063-T5 or T52 aluminum alloy toeboards, unless railing is mounted on curbs or other construction of sufficient height and type to comply with OSHA 1910.23. Bars or plates are not acceptable.
   2. Unless otherwise specified, toeboards shall comply with OSHA 1910.23, Section (e).

N. System Components and Miscellaneous Accessories: Provide complete selection of manufacturer's standard and custom aluminum handrail and railing systems components and miscellaneous accessories required. Show type and location of all such items on Shop Drawings and other submittals as applicable.

2.4 FABRICATION

A. General: Unless otherwise shown or specified, provide typical non-welded construction details and fabrication techniques recommended in NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501.

B. Fabricate handrail and railing systems true to line and level, with accurate angles surfaces and straight edges. Fabricate corners without using fittings. Provide bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work. Form elbow bends and wall returns to uniform radius, free from buckles and twists, with smooth finished surfaces, or use prefabricated bends. Provide not less than four-inch outside radius.

C. Remove burrs from exposed edges.

D. Close aluminum pipe ends by using prefabricated fittings.

E. Weep Holes:
   1. Fabricate joints that will be exposed to weather to exclude water.
   2. Provide 15/64-inch diameter weep holes at lowest possible point on each post in handrail and railing systems.
   3. Provide pressure relief holes at closed ends of handrail and railing systems.

F. Toeboards:
   1. Provide manufacturer's standard toeboard, that accommodates movement caused by thermal change specified without warping or bowing toeboards.
   2. Provide manufacturer's standard toeboard, which accommodates storage for removable socket covers.
   3. Coordinate and cope toeboard as required to accommodate cover flanges at posts.

4. Toeboards shall follow curvature of railing. Where railing is shown to have curved contours at corners, or other locations, toeboard shall likewise be curved to follow line of railing system.

G. Reinforcing Bars: Provide reinforcing bar friction-fitted at each post in railing system. Extend reinforcing bars of tubes six inches into cast-in-place sleeves or other types of supporting brackets.

H. Mechanically Fitted Component Pipe Handrail and Railing System:
1. Use non-welded pipe handrail and railing system with posts, top and intermediate rail, and flush joints.
2. Provide top and one intermediate horizontal rail(s), equally spaced.
3. Do not use blind rivets, pop rivets, or other exposed fastening devices in the Work under this Section. Fasteners used for side-mounting fascia flanges where shown or specified may be exposed in the Work. Provide internal threaded aluminum rivets, stainless steel through-bolts with lock nuts, stainless steel sheet metal screws with lock washers, and epoxy adhesive for fastening components of the Work.

2.5 FINISHES

A. General:
1. Prepare surfaces for finishing in accordance with recommendation of aluminum producer and the aluminum finisher or processor.
2. Adjust and control direction of mechanical finishes specified to achieve best overall visual effect in the Work.
3. Color and Texture Tolerance: Provide uniform color and continuous mechanical texture for aluminum components. ENGINEER reserves the right to reject aluminum materials because of color or texture variations that are visually objectionable, but only where variation exceed range of variations established by manufacturer prior to fabrication, by means of range of Samples approved by ENGINEER.
4. Anodize aluminum components.

B. Finish:
1. Mechanically finish aluminum by wheel or belt polishing with aluminum oxide grit of 180 to 220 size, using peripheral wheel speed of 6,000 feet per minute; AA Designation - M32 Medium Satin Directional Texture.
2. Hand-Rubbed Finish: Where required to complete the Work and provide uniform, continuous texture, provide hand-rubbed finish to match medium satin directional texture specified to even out and blend satin finishes produced by other means.

C. Cleaning:
1. Provide non-etching chemical cleaning by immersing aluminum in inhibited chemical solution, as recommended by coating applicator, to remove lard oil, fats, mineral grease, and other contamination detrimental to providing specified finishes.

2. Clean and rinse with water between steps as recommended by aluminum manufacturer.

D. Exposed Aluminum Anodic Coating: Provide anodic coatings as specified that do not depend on dyes, organic or inorganic pigments, or impregnation processes to obtain color. Apply coatings using only the alloy, temperature, current density, and acid electrolytes to obtain specified colors in compliance with designation system and requirements of NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501. Comply with the following:
   1. Provide Architectural Class I high density anodic treatment by immersing the components in tank containing solution of 15 percent sulfuric acid at 70 degrees F with 12 amperes per square foot of direct current for minimum of sixty minutes; AA Designation A41 Clear.
   2. Physical Properties:
      a. Anodic Coating Thickness, ASTM B244: Minimum of 0.7-mils thick.
      b. Anodic Coating Weight, ASTM B137: Minimum of 32 mg/sq. in.
      c. Resistance to Staining, ASTM B136: No stain after five minutes dye solution exposure.
      d. Salt Spray, ASTM B117: 30,000 hours exposure with no corrosion or shade change.
   3. Seal finished anodized coatings using deionized boiling water to seal pores and prevent further absorption.
   4. Products and Manufacturers: Provide one of the following:
      a. Alumilite 215 Clear by Aluminum Company of America, Inc.
      b. Or equal.

2.6 SOURCE QUALITY CONTROL

A. Allowable Tolerances:
   1. Limit variation of cast-in-place inserts, sleeves and field-drilled anchor and fastener holes to the following:
      a. Spacing: Plus-or-minus 3/8-inch.
      b. Alignment: Plus-or-minus 1/4-inch.
      c. Plumbness: Plus-or-minus 1/8-inch.
   2. Minimum Handrails and Railings Systems Plumb Criteria:
      a. Limit variation of completed handrail and railing system alignment to 1/4-inch in 12 feet with posts set plumb to within 1/16-inch in 3.0 feet.
      b. Align rails so variations from level for horizontal members and from parallel with rake of stairs and ramps for sloping members do not exceed 1/4-inch in 12.0 feet.
   3. Provide “pencil-line” thin butt joints.

B. Factory Testing:
   1. Perform load test on completed handrail and railing systems. Extent of handrail and railing systems to be factory-tested shall be as shown and specified.
   2. Load test completed handrail and railing systems in accordance with requirements of ASTM E935. Provide written report to ENGINEER identifying and documenting testing methods used, magnitude and location of

loads superimposed, and results of such tests on actual completed handrail and railing systems, including all anchors and fasteners to be used in the Work. Testing setup shall simulate actual conditions of installation to be used in the Work.

3. Do not ship products from factory until ENGINEER accepts load testing report.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which Work will be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Verify to ENGINEER the gage of aluminum pipe railing posts and rails brought to the Site by actual measurement of on-Site material in presence of ENGINEER.

3.2 INSTALLATION

A. General:
   1. Do not erect components that are scarred, dented, chipped, discolored, otherwise damaged, or defaced. Remove from Site railing and handrail system components that have holes, cuts, gouges, deep scratches, or dents of any kind. Repairs to correct such Work will not be accepted. Remove and replace with new material.
   2. Comply with installation and anchorage recommendations of NAAMM/AMP Pipe Railing Manual and NAAMM/AMP AMP 501 in addition to requirements specified and approved or accepted (as applicable) submittals.

B. Fastening to In-Place Construction:
   1. Remove protective plastic immediately before installing.
   2. Adjust handrails and railings prior to securing in place, to ensure proper matching at butting joints and correct alignment throughout their length. Plumb posts in each direction. Secure posts and rail ends to building or structure as follows:
      a. Anchor posts in concrete by providing sockets set and anchored into concrete floor slab. Provide closure secured to bottom of sleeve. Before installing posts, remove debris and water from sleeves. Verify that reinforcing bars or tubes have been inserted into posts before installation. Do not install posts without reinforcing bar. For all non-removable handrail and railing systems sections, after posts have been inserted into sockets, fill annular space between posts and sockets solid with grout as specified in Section 03 60 00, Grouting. Crown the grout and slope grout to drain away from posts.

b. Side-mount posts by fastening them securely in brackets attached to steel or concrete fascia as shown and in accordance with approved or accepted (as applicable) submittals.
c. Provide removable railing sections where shown. Provide removable railing system posts with friction-fitted reinforcing bar in each post. Provide sockets with socket covers stored in extruded toeboard. Provide aluminum pipe collars for all removable posts. Accurately locate sleeves to match post spacing.
d. Provide posts set in concrete with an aluminum floor cover flange.

3. Use devices and fasteners recommended by handrail and railing systems manufacturer and as shown on approved or accepted (as applicable) submittals.

C. Cutting, Fitting, and Placement:
1. Perform cutting, drilling and fitting required for installation. Set the Work accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels.
2. Fit exposed connections accurately together to form tight hairline joints. Do not cut or abrade surfaces of units that have been finished after fabrication, and are intended for field connections.
3. Make permanent field splice connections using manufacturer's recommended epoxy adhesive and five-inch minimum length connector sleeves. Tight press-fit field splice connectors and install in accordance with manufacturer's written instructions. Follow epoxy manufacturer's recommendations for requirements of installation and conditions of use.
4. Make splices as near as possible to posts, but not exceeding 12 inches from nearest post.
5. Field welding is not allowed. Make splices using pipe splice lock employing a single allen screw to lock joint.
6. Provide hinged gates as shown.
7. Secure handrails to walls with wall brackets and end fittings as shown. Drill wall plate portion of the bracket to receive one bolt, unless otherwise shown for concealed anchorage. Locate brackets as shown or, if not shown, at not more than five feet on centers. Provide flush type wall return fittings with same projection shown for wall brackets. Secure wall brackets and wall return fittings to building or structure. Refer to Section 05 05 33, Anchor Systems.
8. Securely fasten toeboards in place with not more than 1/4-inch clearance above floor level.
9. Drill one 15/64-inch diameter weep hole not more than 1/4-inch above top of location of solid reinforcing bar or tube in each post.

D. Expansion Joints:
1. Provide slip joint with internal sleeve extending not less than two inches beyond joint on each side.
2. Construct expansion joints as for field splices, except fasten internal sleeve securely to one side of rail only.
3. Locate joints within six inches of posts.

E. Seismic Joints:
   1. Discontinue handrails and railings on each side of seismic joints where handrails and railings cross over seismic joints in structure.
   2. Comply with details shown on the Drawings.

F. Protection from Dissimilar Materials:
   1. Coat aluminum surfaces in contact with dissimilar materials such as concrete, masonry, and steel, in accordance with Section 09 91 00, Painting.
   2. Do not extend coating beyond contact surfaces. Remove coating where exposed-to-view in the finished Work.

3.3 CLEANING AND REPAIRING

A. Cleaning:
   1. Clean exposed surfaces of handrail and railing systems after completion of installation. Comply with recommendations of both handrail and railing system manufacturer and finish manufacturer. Do not use abrasives or unacceptable solvent cleaners. Test cleaning techniques on an unused section of railing before employing cleaning technique.
   2. Remove stains, dirt, grease, and other substances by washing handrails and railings systems thoroughly using clean water and soap, then rinse with clean water.
   3. Do not use acid solution, steel wool, or other harsh abrasives.
   4. If stain remains after washing, remove defective sections and replace with new material complying with this Section.

B. Handrails and railings shall be free of dents, burrs, scratches, holes, and other blemishes. Replace damaged or otherwise defective Work with new material that complies with this Section at no additional cost to OWNER.

C. Prior to Substantial Completion, replace adjacent work marred by the Work of this Section.

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SECTION 05 53 16

ALUMINUM GRATING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install aluminum grating and frames.
   2. The Work includes:
      a. Providing grating, frames, and appurtenances.
      b. Providing openings in aluminum grating to accommodate the Work under this and other Sections, and attaching to aluminum grating all items such as sleeves, bands, studs, fasteners, and items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before aluminum grating Work.

C. Related Sections:
   1. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AA Aluminum Design Manual.
   2. ASTM B210, Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.
   4. ASTM B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   5. NAAMM MBG 531, Metal Bar Grating Manual.
   6. NAAMM MBG 533, Welding Specifications for Fabrication of Steel, Aluminum and Stainless-Steel Bar Grating.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Shall have at least five years-experience manufacturing products substantially similar to those required and shall be able to submit documentation of at least five installations in satisfactory operation for at least five years each.

B. Component Supply and Compatibility:

1. Obtain all products and materials included in this Section regardless of component manufacturer from a single aluminum-grating manufacturer.
2. Aluminum grating manufacturer shall review and approve or prepare all Shop Drawings and other submittals for all products and materials furnished under this Section.
3. Components shall be suitable for the specified service conditions and be integrated into overall assembly by aluminum grating manufacturer.
4. Provide only one type of aluminum grating exclusively throughout the Project.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Fabrication and erection of all Work. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items.
      b. Setting drawings and templates for location and installation of anchorage devices.
   2. Product Data:
      a. Manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions.
   3. Samples:
      a. Representative Samples of grating, appurtenances and other finished products requested by ENGINEER.
      b. ENGINEER'S review will be for type and finish only. Compliance with all other requirements is exclusive responsibility of CONTRACTOR.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices to be embedded in cast-in-place concrete in ample time to prevent delaying the Work.
   2. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
   1. Protect materials from corrosion and deterioration.
   2. Do not store materials in contact with concrete or other materials that might cause corrosion, staining, scratching, or damage materials or finish.
   3. Comply with Section 01 66 00, Product Storage and Handling Requirements.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Aluminum Grating: Provide aluminum grating complying with the following:
   1. Grating Design Loads: Uniform live load shall be as shown or indicated in the Contract Documents. Where live load is not shown or indicated, uniform live and concentrated loads shall be as indicated in the table below, whichever results in the greater design stresses.

	Live Load	Concentrated Load
a.	300 psf	1,500 lbs. per foot of grating width at center of span

   2. Maximum Clear Span Deflection for Uniform Live Loads: 1/120 of span, but not more than 1/4-inch.
   3. Maximum Fiber Stress: 12,000 psi.
   4. Do not install aluminum grating in areas subject to vehicular traffic.
   5. Minimum Size of Members:
      a. Minimum size of bearing bars shall be within standard mill tolerance as indicated in load tables in NAAMM MBG 531 for applicable loading and deflection requirements.
      b. Minimum dimensions of cross bars shall be as indicated in tables of Minimum Standard Cross Bars and Connecting Bars in NAAMM MBG 531.
   6. Banding bar shall be 1/4-inch thick minimum. Top of banding bar shall be flush with top of grating, unless otherwise shown or indicated. Banding bar shall be 1/4-inch shorter than the bearing bar height.
   7. Comply with requirements of AA Aluminum Design Manual.

B. Stair Treads: Provide stair treads complying with the following:
   1. Stair Tread Design Loads: Concentrated live load shall be:
      a. 300 pounds on front-most five inches of tread at center of tread of span up to 5.5 feet.
      b. 300 pounds on front-most five inches of tread at the one-third points of tread of span greater than 5.5 feet.
   2. Maximum Clear Span Deflection for Concentrated Live Loads: 1/240 of span, but not more than 1/4-inch.
   3. Maximum Fiber Stress: 12,000 psi.
   4. Minimum Size of Members:
      a. Minimum size of bearing bars shall be within standard mill tolerance as indicated in load tables in NAAMM MBG 531 for applicable loading and deflection requirements.
      b. Minimum dimensions of cross bars shall be as indicated in tables of Minimum Standard Cross Bars and Connecting Bars in NAAMM MBG 531.
   5. Carrier plate shall be 1/4-inch thick minimum. Top of carrier plate shall be flush with top of tread, unless otherwise shown or indicated. Provide carrier plate with hole and slot for attachment to stringer.

6. Comply with requirements of AA Aluminum Design Manual.

2.2 MANUFACTURERS

A. Grating, Products and Manufacturers: Provide one of the following:
   1. Swage-Locked I-Bar Grating, by IKG Industries.
   2. Swage-Locked I-Bar Grating, by AMICO.
   3. Or equal.

B. Stair Treads, Products and Manufacturers: Provide one of the following:
   1. I-Bar Treads, by IKG Industries.
   2. I-Bar Treads, by AMICO.
   3. Or equal.

2.3 MATERIALS

A. Bearing Bars: Aluminum alloy 6061-T6 or alloy 6063-T6, complying with ASTM B221.

B. Cross Bars or Bent Connecting Bars: Aluminum alloy 6061-T6 or alloy 6063-T6, complying with either ASTM B221 or ASTM B210.

C. Frames: Aluminum alloy 6061-T6 or alloy 6063-T6, complying with ASTM B221.

D. Stud anchors welded to steel supports and other fasteners shall be Type 316 stainless steel.

2.4 FABRICATION

A. Use materials of minimum depth and thickness specified and required to comply with performance criteria in the Contract Documents.

B. Provide grating as follows:
   1. Grating Type: Aluminum I-bar with swage-locked cross bars at right angles to bearing bars.
   2. Depth: One-inch minimum.
   3. Bearing Bars: Aluminum I-bar minimum of one-inch spaced at 1-3/16-inch on centers.
   4. Cross-Bars: Swage-locked to bearing bars at maximum spacing of four inches on centers.
   5. Surface: Grooved.
   6. Finish: Mill.

C. Provide stair treads as follows:
   1. Tread Type: Aluminum I-bar with swage-locked cross bars at right angles to bearing bars.
   2. Depth: One-inch minimum.

3. Bearing Bars: Aluminum I-bar minimum one-inch spaced at 1-3/16-inch on centers.
4. Cross Bars: Swage-locked to bearing bars at maximum spacing of four inches on centers.
5. Surface: Grooved.
6. Nosing: Cast aluminum abrasive nosing.
7. Finish: Mill.

D. Provide cutouts in grating for passage of piping, electrical conduit, valve stems, columns, ducts, and similar work. Where more than two bearings bars are included in a cut out, provide banding bars of same dimensions as bearing bars around opening welded to grating component parts.

E. Gratings shall be accurately fabricated, free from warps, twists, and other defects that would affect grating appearance and grating serviceability.

F. Welding shall conform to requirements of NAAMM MBG 533. Welds shall be ground smooth at top surfaces and bearing surfaces.

G. Openings in and edges of gratings sections shall be banded with banding bars. Weld bands to intersecting members.

H. Size each section of grating to weigh not more than 100 pounds, unless otherwise indicated in the Contract Documents.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions under which Work is to be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Check all dimensions at the Site after piping and equipment are in place and determine exact locations of openings and cutouts.

3.2 INSTALLATION

A. Fastening to In-Place Construction:
1. Use anchorage devices and fasteners to secure aluminum grating to supporting members or prepared openings, as recommended by manufacturer.
2. Weld Type 316 stainless steel stud bolts to receive saddle clip or flange block anchors to supporting steel members. Drill for machine bolts when supports are aluminum.

B. Cutting, Fitting, and Placing:
   1. Perform cutting, drilling, and fitting required for installation. Set the Work accurately in location, alignment and elevation, plumb, level, true, and free of rack. Do not use wedges or shimming devices.
   2. Where gratings are penetrated by piping, electrical conduit, ducts, structural members, or similar protrusions, cut openings neatly and accurately to size and attach banding bar as specified.
   3. Divide panels into sections only to extent required for installation where aluminum grating is to be installed around previously installed piping, electrical conduit, ducts, structural members, or similar protrusions.

C. Aluminum gratings in concrete floors shall be removable and arranged in sizes to be readily lifted. Provide aluminum gratings in concrete with aluminum angle frames with mitered corners and welded joints. Grind exposed joints smooth. Frames shall have welded anchors set into concrete. Angle size shall match grating depth selected for flush fit.

D. Clearance at ends or between sections of grating shall be a maximum of 1/4-inch.

E. Tops of aluminum gratings shall be set flush with surrounding construction.

F. Aluminum gratings shall be set with full and uniform end bearing on frames to preclude rocking movement; do not use wedges or similar shimming devices.

G. Protection of Aluminum from Dissimilar Materials: Coat aluminum surfaces in contact with dissimilar materials such as concrete, masonry, steel, or other metals, in accordance with Section 09 91 00, Painting.

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SECTION 05 54 63

FLOOR ACCESS HATCH COVERS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install floor access hatch covers.
   2. The Work also includes:
      a. Providing openings in and attachments to floor access hatch covers to accommodate the Work under this and other Sections, and providing for floor access hatch covers items such as anchorage devices, and all items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items to be installed with or before floor access hatch covers Work.

C. Related Sections:
   1. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section:
   1. AASHTO Standard Specifications for Highway Bridges.
   2. MIL-P-21035B, Military Specification, Paint, High Zinc Dust Content Galvanizing Repair.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Manufacturer shall have not less than five years experience producing products substantially similar to those specified and, upon ENGINEER's request, shall submit documentation of not less than five satisfactory installations in place for not less than five years each.

B. Component Supply and Compatibility:

1. Obtain all products included in this Section regardless of the component manufacturer from a single floor access hatch covers manufacturer. Furnishing covers from more than one manufacturer is unacceptable.
2. Floor access hatch covers manufacturer shall prepare, or shall review and approve, all Shop Drawings and other submittals for all components furnished under this Section.
3. Components shall be suitable for specified service conditions and shall be integrated into the overall assembly by the floor access hatch covers manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Detailed plans and other drawings showing location of products and direction of door swing; floor access hatch cover schedules indicating cover location, material, type, loading capacity, and other information; and fabrication details for the access hatch covers Work, including materials, thickness of metals, finishes, latching or locking provisions, type of anchorages, and accessory items.
   2. Product Data:
      a. Copies of manufacturer's literature and specifications for each type of floor access hatch incorporated in the Work.

B. Informational Submittals: Submit the following:
   1. Supplier Instructions:
      a. Installation data, including setting drawings and templates.
   2. Qualifications Statements:
      a. Manufacturer, when requested by ENGINEER.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping:
   1. Protect mill finish and other finish during shipping and installation by an attached, adhesive-backed vinyl material that is removable during and after installation of the access hatch cover.

B. Storage and Protection:
   1. Protect steel members and packaged materials from corrosion and deterioration.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive OWNER of other rights or remedies OWNER may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under the Contract Documents. The

obligations of CONTRACTOR under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.

B. Special Warranty:
   1. Provide manufacturer's written warranty, running to the benefit of OWNER, agreeing to correct, or at option of OWNER, remove or replace structural components of the products specified in this Section found to have defect in material and workmanship during a period of five years after the date of Substantial Completion.

PART 2 – PRODUCTS

2.1 GENERAL

A. General:
   1. Provide manufacturer's standard fabricated access hatch cover units, modified when necessary to comply with the Contract Documents. Where standard units are not available for the sizes and types required, provide custom-fabricated units of the same quality as manufacturer's similar standard-sized units.
   2. Fabricate each access hatch cover unit in the shop, complete with anchors, gaskets, hardware, and accessory items, as required.

2.2 CHANNEL-FRAME TYPE ACCESS HATCH COVERS

A. Aluminum Floor Access Hatch Covers – Channel Frame Type:
   1. Design Live Load: 300 pounds per square foot.
   2. Products and Manufacturers: Provide one of the following:
      a. Single-Leaf Door Aluminum Access Hatch Cover:
         1) Model TPS, by U.S.F Fabrication, Inc.
         2) Type J-AL, by The Bilco Company.
         3) Or equal.
   3. Cover: Not less than 1/4-inch thick, aluminum diamond-pattern plate cover. Provide flush drop-handle for lifting the cover.
   4. Frame: Extruded aluminum channel frame with manufacturer's standard anchor tabs or continuous anchor flange around perimeter for anchorage to concrete.
   5. Drain Coupling: 1.5-inch diameter NPT threaded drain coupling welded under the channel frame for connection of a drain pipe.
   6. Gasket: EPDM gasket mechanically attached to the channel frame.
   7. Hinges: Type 316 stainless steel, heavy-duty butt hinges with Type 316 stainless steel pin fastened to door with Type 316 stainless steel tamper-resistant bolts.
   8. Latch: Type 316 stainless steel, watertight, slam-type latch with inside lever handle and outside removable exterior turn/lift handle fastened to leaf (door)

with tamper-resistant Type 316 stainless steel bolts. Latch release shall be protected by a flush, gasketed, removable screw plug.

9. Lift Assistance: Open-style stainless steel compression springs with Type 316 stainless steel guide tubes. Automatic Type 316 stainless steel hold-open arm with grip handle release.
10. Fall-Through Prevention System: Provide access hatch cover manufacturer's standard safety grating of FRP or aluminum, constructed for live load capacity of not less than 300 psf. Provide hinges and lift-assist to allow grating sections to automatically lock in place in full-open 90-degree position. Provide hold-open arm and release assembly of aluminum or Type 316 stainless steel. Grating shall be colored OSHA "Safety Yellow".
11. Finish: Mill finish.

B. Drain piping for floor access hatch covers with channel frames is under Section 40 05 31, Thermoplastic Process Pipe.

C. Provide Schedule 40 PVC drain piping from the floor access hatch cover channel frame routed as indicated in the Contract Documents.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which floor access hatch cover Work will be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install floor access hatch covers in accordance with approved Shop Drawings and other approved submittals, the Contract Documents, and manufacturer's instructions.

B. Set floor access hatch covers level and true to line or grade, without warp or rack.

C. Drain Piping for Channel Frames:
1. Provide drain piping from the floor access match cover channel frame routed as shown or indicated on the Drawings.
1. Provide drain piping from the floor access hatch cover channel frame and route to the nearest floor drain or sump pit in a manner that does not obstruct access for facility operations and maintenance.
2. After installation, fill drain piping with water. Drain piping shall be free of visible leaks.

D. Protection of Aluminum from Dissimilar Materials: Coat surfaces of aluminum in contact with dissimilar materials such as concrete, masonry, steel, and other metals in accordance with Section 09 91 00, Painting.

3.3 ADJUSTING AND CLEANING

A. Adjust leafs of floor access hatch covers as necessary to provide proper operations.

B. Remove stains, concrete splatter, oils, grease, and other foreign materials necessary and provide clean, finished surfaces.

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SECTION 05 56 00

METAL CASTINGS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install metal castings.
   2. Castings include metal items that are not part of miscellaneous metal fabrications or metal systems in other Specifications Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before metal castings Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI A14.3, Safety Requirements for Fixed Ladders.
   2. ASTM A48/A48M, Specification for Gray Iron Castings.
   3. ASTM A126, Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
   4. ASTM C478, Specification for Precast Reinforced Concrete Manhole Sections.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Shall have at least five years experience manufacturing products substantially similar to those required and shall be able to submit documentation of at least five installations in satisfactory operation for at least five years each.

B. Component Supply and Compatibility:
   1. Obtain all frame, lid or cover, grate, and manhole step products included in this Section regardless of component manufacturer, from a single castings manufacturer.
   2. Obtain all hydrostatic pressure relief valve products included in this Section regardless of component manufacturer, from a single castings manufacturer.
   3. Castings manufacturer shall review and approve or prepare all Shop Drawings and other submittals for all components furnished under this Section.

4. Components shall be constructed for specified service conditions and shall be integrated into overall assembly by castings manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Fabrication and installation of all casting assemblies. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items. Include setting drawings for location and installation of castings and anchorage devices.
   2. Product Data:
      a. Copies of manufacturer's catalog information for the products proposed for use, specifications, load tables, dimension diagrams, anchor details, and installation instructions.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Furnish certification, signed by authorized officer of CONTRACTOR and notarized, stating that all components are furnished by the same manufacturer.
      b. Manufacturer's certification that the casting or lot of castings was made, sampled, tested and inspected in accordance with ASTM A48.
   2. Qualifications Statements: Submit qualifications for the following:
      a. Manufacturer, when required by ENGINEER.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Deliver products to the Site to ensure uninterrupted progress of the Work. Deliver anchorage materials to be embedded in concrete in ample time to prevent delaying the Work.
   2. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
   1. Protect materials from corrosion and deterioration.
   2. Comply with Section 01 66 00, Product Storage and Handling Requirements.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Round Manhole Watertight Frame with Watertight Solid Cover:
   1. Manhole frames and covers shall consist of a frame, cover, and installed gasket as constructed and shown on the Contract Drawings. Tolerance shall be +/- 1/16 inches unless otherwise indicated.

2. Frames and covers shall be designed to withstand AASHTO H20 traffic loading.
3. Frames and covers shall be Westchester County standard as shown on the Contract Drawings.
4. Material: ASTM A48, Class 35B.
5. Products and Manufacturers: Provide one of the following:
    a. 1203B, manufactured by Campbell Foundry Company.
    b. Or equal.

B. Round Manhole Frame with Open Grate:
1. Material: ASTM A48/A48M, Class 35 B.
2. Products and Manufacturers: Provide one of the following:
    a. R-1792-GG, manufactured by Neenah Foundry Company.
    b. V-3610-3, manufactured by East Jordan Iron Works, Inc.
    c. Or equal.

C. Valve Box Frame and Lid:
1. Material: ASTM A48/A48M, Class 35 B.
2. Products and Manufacturers: Provide one of the following:
    a. R-7506-F, manufactured by Neenah Foundry Company.
    b. 3671, manufactured by East Jordan Iron Works, Inc
    c. Or equal.

D. Manhole Steps:
1. Provide manhole steps as shown on the Drawings. Comply with requirements of ASTM C478 and ANSI A14.3.
2. Products and Manufacturers: Provide one of the following:
    a. R-1982-F, manufactured by Neenah Foundry Company.
    b. 8512, manufactured by East Jordan Iron Works.
    c. Or equal.
3. Material: Cast gray iron.

2.2 FABRICATION

A. Fabrication, General:
1. Castings shall be of uniform quality, free of sand holes, gas holes, shrinkage cracks, and other surface defects.
2. Castings shall be ground smooth and well-cleaned by shot blasting in the shop.
3. Design and fabricate round frames and covers to prevent rocking and rattling under traffic loads that will be imposed in actual use.
4. Fabricate castings true to pattern so that component parts fit together.
5. Each casting shall be identifiable and, depending on its size, shall indicate the following: name of producing foundry, ASTM material designation, individual part number, and cast or heat date. Castings shall include all lettering shown or indicated on the Contract Drawings.

PART 3 – EXECUTION

3.1 INSPECCTION

A. Examine conditions under which Work is to be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Comply with casting manufacturer's printed instructions and the Contract Documents. Where castings are installed on precast concrete, fabricated fiberglass, or other fabricated products, install casting in accordance with requirements of manufacturer of product on which casting will be installed.

B. Set castings accurately to required location, alignment, and elevation, plumb, level, true and free of rack, measured from established lines and levels. Where applicable, brace temporarily or anchor temporarily in formwork.

C. Manhole Steps:
   1. Install gray cast iron manhole steps as shown on the Drawings. Comply with requirements of ASTM C478 and ANSI A14.3.
   2. Vertical separation of steps shall be uniform at maximum of 12 inches on centers. Steps shall project evenly from walls.

+ + END OF SECTION + +

SECTION 06 82 13

FIBERGLASS-REINFORCED PLASTIC GRATING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install fiberglass-reinforced plastic (FRP) grating. The Work also includes:
      a. Providing openings in FRP grating to accommodate the Work under this and other Sections and attaching to FRP grating all items such as sleeves, bands, studs, fasteners, and items required for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before FRP grating Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AASHTO, Standard Specifications for Highway Bridges.
   2. ASTM D635, Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
   3. ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Manufacturer shall have a minimum of five years experience producing materials substantially similar to those required and shall be able to submit documentation of at least five installations in satisfactory operation for at least five years each.

B. Component Supply and Compatibility:
   1. Obtain all products furnished under this Section regardless of component manufacturer from a single FRP grating manufacturer.
   2. FRP grating manufacturer shall prepare, or shall review and approve, all Shop Drawings and other submittals for components furnished under this Section.

C. Regulatory Requirements: Comply with the following:
   1. OSHA, 29 CFR 1910.28, Duty to have fall protection and falling object protection.

2. OSHA, 29 CFR 1910.29, Fall protection systems and falling object protection.
3. Building codes referred to in Section 01 42 20, References.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Fabrication and erection drawings and schedules of all materials included under this Section. Include plans, elevations, and details, including connection details. Show anchorage and accessory items. Shop Drawings shall indicate location of planned field cut-outs in grating.
      b. Obtain ENGINEER's approval of field cut-outs in grating.
   2. Product Data:
      a. Manufacturer's specifications, load tables, dimension diagrams, and anchorage details.
   3 Samples:
      a. Representative Samples of grating, appurtenances, and other finished materials requested by ENGINEER.
      b. ENGINEER'S review will be for type and finish only. Compliance with all other requirements is exclusive responsibility of CONTRACTOR.

B. Informational Submittals; Submit the following:
   1. Manufacturer Instructions:
      a. Setting drawings and templates for location and installation of anchorage devices.
      b. Manufacturer instructions for handling, storing, and installing the materials furnished.
   2. Qualifications Statements:
      a. Manufacturer qualifications, when requested by ENGINEER.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection:
   1. Protect materials from corrosion, staining, scratching, and deterioration.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. General:
   1. Maximum clear span deflection under uniform load equal to 250 pounds per square foot shall be the smaller of 1/200 of span or 1/4-inch, at four feet.
   2. Flame Spread Rating: 25 or less, ASTM E84; self-extinguishing ASTM D635.
   3. Sheet Size: As shown or indicated in the Contract Documents, and as required to comply with deflection requirements.
   4. Design Loads:
      a. Uniform live load shall be as shown. Where the live load is not shown,

the uniform live load shall be as indicated below or the indicated concentrated load, whichever gives the greatest stresses.

	Live Load (psf)	Concentrated Load (lbs per foot of grating at center of span)	Location(s)
1)	300	1,500	Dry Well and Wet Well

b. Maximum Clear Span Deflection for Uniform Live Loads: 1/240 of span, but not more than 1/4-inch.
c. Maximum Clear Span Deflection for Concentrated Loads: 1/180 of span.

B. Molded FRP Grating: Provide materials complying with the following:
1. Grating shall be molded construction with tops and bottoms of bearing bars and cross-bars in same plane. Grating shall have square mesh pattern providing bi-directional strength.
2. Pattern: 1.5-inch on centers.
3. Thickness: 1.5-inch.

C. FRP Stair Treads: Provide stair treads complying with the following:
1. Stair Tread Design Loads: Concentrated live load shall be:
a. 300 pounds on front-most five inches of tread at center of tread of span up to 5.5 feet.
b. 300 pounds on front-most five inches of tread at the one-third points of tread of span greater than 5.5 feet.
2. Maximum Clear Span Deflection for Concentrated Live Loads: 1/240 of span, but not more than 1/4-inch.
3. Maximum Fiber Stress: 12,000 psi.

2.2 MANUFACTURERS

A. Molded FRP Grating:
1. Products and Manufacturers: Provide one of the following:
a. Fibergrate Molded Grating, by Fibergrate Composite Structures, Inc.
b. Duragrate Molded Fiberglass Grating, by Strongwell Corporation.
c. Or equal.

D. Stair Treads:
1. Products and Manufacturers: Provide one of the following:
a. Fibertread Molded Grating Treads, by Fibergrate Composite Structures, Inc.
b. DURATREAD Molded Grating Treads, by Strongwell Corporation.
c. Or equal.

2.3 MATERIALS

A. Fiberglass-Reinforced Plastic (FRP):
1. Premium-grade, fire-retardant vinyl ester resin with glass reinforcing.

2. Finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes, or un-reinforced areas. Glass fibers shall be well-covered with resin to protect against exposure due to wear and weathering.

B. Attachment, Clips, Fasteners, and Hardware: Provide Type 316 stainless steel clips, bolts, nuts, washers, sleeves, fasteners, and associated hardware.

C. Color and Finish of Grating:
   1. Color: Dark gray.

2.4 FABRICATION

A. General:
   1. Use materials in accordance with the Contract Documents and approved Shop Drawings and submittals.
   2. Sealing: Coat shop-fabricated cuts in FRP with vinyl ester resin.

B. Grating:
   1. Reinforce grating with continuous rovings of equal number of layers in each direction. Top layer of reinforcing shall be no more than 1/8-inch below top surface of grating to provide maximum stiffness and prevent resin chipping of un-reinforced surfaces. Percentage of glass (by weight) shall not exceed 35 percent.
   2. After molding, dry glass fibers shall not be visible on surface of bearing bars or cross bars. Bars shall be smooth and uniform with no evidence of fiber orientation irregularities, interlaminar voids, porosity, resin over-rich, or resin-starved areas.
   3. Non-slip Surfacing: Grating shall have integrally-applied grit top on the surface of each bar providing maximum slip resistance.
   4. Grating bar intersections shall be filleted to minimum radius of 1/16-inch to eliminate local stress concentrations and reduce the potential for resin cracking.
   5. Layout: Each grating section shall be readily removable, except where shown or indicated on the Drawings. Manufacturer shall provide openings and holes where shown or indicated on the Drawings. Grating openings around protrusions such as structural elements, piping, conduit, shafts or other machinery, shall be discontinuous at the approximate centerline of the associated opening so each section of grating is readily removable.
   6. Provide FRP grating to be installed in concrete with FRP angle frames having mitered corners and welded joints. Frames shall have welded anchors set into concrete. Angle size shall match grating depth selected for flush fit of grating.
   7. Where grating is cut, seal the cut surfaces with catalyzed resin sealant of equal or superior corrosion resistance to the grating. Sealant shall be as recommended by grating manufacturer.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Grating Installation:
   1. After structural elements, piping, conduit, shafts and other equipment are in place check all dimensions in the field and determine required grating cutouts.
   2. Placing:
      a. Install FRP grating with each section readily removable and replaceable, unless shown or indicated otherwise in the Contract Documents. Provide end-banding bars for each grating panel.
      b. Set tops of FRP gratings flush with surrounding construction.
      c. Install FRP grating with full and uniform end bearing on frames or bearing surfaces to preclude rocking movement. Do not use wedges or similar shimming devices.
      d. Provide FRP grating in concrete with angle frames. Grind exposed joints of angle frames smooth.
   3. Cutting and Fitting:
      a. Perform cutting, drilling, and fitting required for installation. Set the grating Work accurately in location, alignment, and elevation, plumb, level, true, and free of rack. Do not use wedges or shimming devices.
      b. Provide cutouts or openings in the field as approved by ENGINEER.
      c. Seal cut surfaces of grating requiring cutting during installation with sealant.
   4. Connections to Structural Elements and Bearing Surfaces:
      a. Attach gratings to bearing surface in accordance with grating manufacturer's recommendations
      b. Secure grating to FRP structural members, as required by manufacturers of grating and FRP structural member.
   5. Joints:
      a. Fit exposed connections accurately together to form tight joints.
      b. Adjacent units of FRP grating sections shall be neatly fitted together.
      c. Clearance at the ends or between sections of FRP grating shall be a maximum of 1/4-inch.
   6. Jointing Connections:
      a. Secure edges of grating to each other with end-panel clips.
      b. Secure clips to grating with bolts so that grating acts as a unit. Install bolts not more than three inches from each plate section end and not more than two feet on centers.

c. For each FRP grating panel, provide four saddle clip anchors designed to fit over two adjacent grating section, and four stud bolts with washers and nuts for each grating panel

+ + END OF SECTION + +

SECTION 06 82 23

FIBERGLASS-REINFORCED PLASTIC
HANDRAILS AND RAILINGS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, incidentals, and professional design services as shown, specified, and required to furnish and install fiberglass-reinforced plastic (FRP) handrails and railings. The Work also includes:
      a. Providing openings in, and attachments to, FRP handrail and railing systems to accommodate the Work under this and other Sections. Provide all items for FRP handrails and railings, including anchorages, fasteners, studs, and other items required for which provision for is not specifically included under other Sections.
   2. FRP handrails and railings Work shall include components and features shown and specified, and all components and features available from specified manufacturers required for providing complete FRP handrail and railing system in accordance with the Contract Documents.
   3. Handrail and railing systems are shown to indicate general types of locations where handrails and railings are required. Where handrail or railing systems are not shown but may reasonably be inferred from the Contract Documents as required by either an authority having jurisdiction, OSHA, or other Laws or Regulations, provide handrail and railing systems of the type specified in this Section at no additional cost to OWNER.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before FRP handrails and railings Work.
   2. FRP handrail and railings shall comply with Laws and Regulations. When CONTRACTOR is aware that FRP handrails and railings Work shown or indicated in the Contract Documents does not comply with Laws or Regulations, obtain written interpretation from ENGINEER.

C. Related Sections:
   1. Section 03 60 00, Grouting.
   2. Section 05 05 33, Anchor Systems.

1.2 REFERENCES

A. Standards referenced in this Section are:

1. ANSI/ASSE A1264.1, Safety Requirements for Workplace/Working Surfaces and Their Access; Workplace Floor, Wall and Roof Openings; Stairs and Guardrails Systems.
2. ASTM D635, Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
3. ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Manufacturer shall have a minimum of five years experience producing materials substantially similar to those required and shall be able to submit documentation of at least five installations in satisfactory operation for at least five years each.
      b. Manufacturer shall be capable of preparing and submitting custom detail shop drawings for the materials required.
   2. Professional Engineer:
      a. CONTRACTOR or handrail and railing manufacturer shall retain a registered professional engineer legally qualified to practice in jurisdiction where the Site is located. Professional engineer shall have at least five years experience designing FRP handrails and railings.
      b. Responsibilities include:
         1) Reviewing FRP handrail and railing system performance and design criteria stated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to ENGINEER by CONTRACTOR.
         3) Preparing or supervising preparation of design calculations verifying compliance of FRP handrail and railing system with requirements of the Contract Documents.
         4) Signing and sealing all calculations.
         5) Certifying that:
            a) Design of FRP handrail and railing system was performed in accordance with performance and design criteria stated in the Contract Documents, and
            b) Design conforms to Laws and Regulations, and to prevailing standards of practice.
   3. Installer:
      a. Retain a single installer trained and with record of successful experience installing FRP handrail and railing systems.
      b. Installer shall have record of successfully installing FRP handrail and railing systems in accordance with recommendations and requirements of manufacturer, or shall submit evidence of being acceptable to the manufacturer.
      c. Installer shall employ only tradesmen with specific skill and successful experience in the type of Work required.

d. When requested by ENGINEER, submit name and qualifications of installer with the following information for at least three successful, completed projects:
   1) Names and telephone numbers of owner and architect or engineer responsible for each project.
   2) Approximate contract cost of the FRP handrail and railing systems for which installer was responsible.
   3) Amount (linear feet) of FRP handrail and railing installed.

B. Component Supply and Compatibility:
   1. Obtain all products furnished under this Section regardless of component manufacturer, from a single FRP handrail and railing system manufacturer.
   2. FRP handrail and railing system manufacturer shall prepare, or shall review and approve, all Shop Drawings and other submittals (except for delegated design submittals, when professional engineer is retained by other than handrail and railing manufacturer) for all components furnished under this Section.
   3. Components shall be suitable for the specified service conditions and shall be integrated into overall assembly by FRP handrails and railings manufacturer.

C. Regulatory Requirements: Comply with the following:
   1. OSHA, 29 CFR 1910.28, Duty to have fall protection and falling object protection.
   2. OSHA, 29 CFR 1910.29, Fall protection systems and falling object protection.
   3. Building codes referred to in Section 01 42 20, References.

D. Certifications:
   1. Furnish notarized certification, signed by authorized officer of manufacturer, stating that handrail and railing systems conform to the design prepared by the professional engineer.
   2. Furnish notarized certification, signed by authorized officer of CONTRATOR, stating that all components and fittings are furnished by the same manufacturer

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Submit drawings for fabricating and installing FRP handrail and railing systems with sizes of members, tube wall thickness, information on components, and anchorage devices. Show all anchorages. Include details drawn at scale of 1.5-inch equal to one foot.
      b. Indicate required location of posts.
      c. Indicate locations and details of all expansion joints, if any.
      d. Indicate locations and details of gaps across seismic joints, if any.
      e. Profile drawings of FRP handrail and railing system components.
      f. Custom detail drawings. Details of forming, jointing, sections, connections, internal supports, trim, and accessories. Include details drawn at scale of 1.5-inch equal to one foot.
   2. Product Data:

a. Manufacturer’s published literature, specifications, standard detail drawings for FRP handrail and railing systems.
b. Manufacturer’s catalogs showing complete selection of standard and custom components and miscellaneous accessories for selection by ENGINEER.

3. Delegated Design Submittals:
   a. Design computations or complete structural analysis of handrail and railing systems, signed and sealed by professional engineer. Professional engineer’s seal shall be clearly legible, including jurisdiction of registration, registration number, and name on seal.
   b. Certification by professional engineer that professional engineer has performed design of FRP handrail and railing systems in accordance with performance and design criteria stated in the Contract Documents, and that design complies to Laws and Regulations, and to prevailing standards of practice.
4. Samples:
   a. Full-size Sample, two feet long, of assembled railing system at post and rail intersections. Sample shall have all associated components including typical connections, mounted toeboard and sleeve, and handrail at wall return, complete with mounting brackets, all with specified controlled uniform finish.
   b. Color Samples: Submit standard colors.
   c. Samples will be reviewed for finish, color, joint tolerances, workmanship, and general component assembly only. Compliance with other requirements is CONTRACTOR's responsibility.
5. Test Procedure:
   a. Submit detailed description of proposed shop testing procedures. Do not perform shop testing until ENGINEER approves shop test procedure.
   b. Submit detailed description of proposed field testing procedures. Do not perform field testing until ENGINEER approves test procedure.

B. Informational Submittals: Submit the following:
1. Certificates:
   a. Manufacturer certification that materials were fabricated in accordance with professional engineer's design, in accordance with Paragraph 1.3 D.1 of this Section.
   b. Certification on source of supply, in accordance with Paragraph 1.3 B and Paragraph 1.3.D.2 of this Section.
2. Supplier Instructions:
   a. Instructions for handling, storing, and installing materials furnished.
   b. Templates for mounting to concrete.
3. Source Quality Control Submittals:
   a. Manufacturer’s load testing report for FRP handrail and railing systems to be furnished for the Project, demonstrating compliance with requirements of the Contract Documents and Laws and Regulations.
4. Field Quality Control Submittals:

a. Load testing report for completed, installed FRP handrail and railing systems at the Site, demonstrating compliance with requirements of the Contract Documents and Laws and Regulations.

5. Qualifications Statements: Submit qualifications for the following:
   a. Manufacturer, when requested by ENGINEER.
   b. Professional engineer, when requested by ENGINEER.
   c. Installer, when requested by ENGINEER. Qualifications statement shall include record of experience with references specified.

C. Closeout Submittals: Submit the following:
   1. Operations and Maintenance Data: Submit maintenance manuals for materials furnished under this Section, including:
      a. Comply with Section 01 78 23, Operations and Maintenance Data.
      b. Detailed procedures for routine maintenance and cleaning, including cleaning materials, application methods, and precautions in using the materials that may be detrimental to finish when improperly applied.
      c. Handrail and railings systems manufacturer's current catalog including individual parts.
   2. Extra Stock Materials:
      a. After completing installation, deliver to OWNER as extra stock materials five percent of actual quantity of each handrail and railing system component used in the FRP handrails and railings Work.
      b. Comply with Section 01 78 43, Spare Parts and Extra Materials.

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection:
   1. Protect materials from corrosion, staining, scratching, and deterioration.
   2. Protect handrails and railings by paper or coating as acceptable to handrail and railing manufacturer, against scratching, splashes of mortar, paint, and other marring during transportation, handling, and erection. Protect until completion of adjacent work.

B. Handling of Products:
   1. Do not subject handrail and railing materials to bending or stress.
   2. Do not damage edges or handle materials in a manner that will cause scratches, warping, or dents.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. System Description:
   1. Railing system shall consist of top and two intermediate horizontal rail(s) equally spaced, with toeboards where applicable.
   2. Rails, Posts, and Toeboards:

a. Rails shall each be minimum 1.75-inch square tube, with minimum 1/8-inch wall thickness.
b. Posts shall be minimum of two-inch square tube, 5/32-inch wall thickness with solid reinforcing stiffener.
c. Rails shall be continuous at post intersections.
d. Toeboards shall be 1/2-inch deep by four inches high. Toeboard shall have reinforcing ribs or other manufacturer-standard fabricated toeboard approved by ENGINEER.

3. Nominal Handrail Height Above Floor: In accordance with Laws and Regulations, but not less than 3.5 feet.
4. Comply with ANSI/ASSE A1264.1.

B. Design Criteria:
1. FRP handrail and railing system shall consist of equally-spaced horizontal rails, mechanical fasteners, and adhesively bonded components, fastened to posts spaced not more than five feet on centers and a system of handrails supported from adjacent construction by mounting brackets spaced at not more than five feet on centers.
2. Design Loads: Design, fabricate, and install FRP handrail and railing systems to withstand the most critical effects resulting from the following loads (loads listed below do not act concurrently):
a. Uniform Load: 50 pounds per foot, applied at top in any direction.
b. Concentrated Load: 200 pounds single load, applied at any point along the top in any direction.
c. Components: Intermediate rails shall withstand horizontally-applied normal load of 50 pounds on an area equal to one square foot, including openings and space between rails. Reactions due to this loading are not required to be superimposed to loading specified for main supporting members of handrails and railings.
d. Comply with generally accepted standards used in the FRP industry for determining allowable stresses and safety factors for structural FRP components.
e. Limit deflection in each single span of railing and handrail to 1.5-inch maximum, and to 1.4-inch maximum on railing posts. Applied loads shall not produce permanent deflection in the completed Work when loads are removed.
3. Thermal Control:
a. Provide adequate expansion within fabricated systems that allows for thermal expansion and contraction caused by material temperature change from 140 degrees F to -20 degrees F without warp or bow of system components.
b. Distance between expansion joints shall be based on providing 1/4-inch wide joint at 70 degrees F, that accommodates movement of 150 percent of calculated amount of movement for specified temperature range.
4. Where handrail and railing systems cross expansion joints in the building or structure, provide expansion joints in handrail and railings systems.
5. For posts located at or near end of runs as shown, uniformly space intermediate posts as required to comply with loading and deflection criteria specified, at

intervals no greater than maximum post spacing specified. Where posts are shown or indicated for handrails along both sides of walkways and other similar locations, locate posts opposite each other; do not stagger post locations.

6. Provide each railing system post with solid reinforcing stiffener with outside dimension equal to inside dimension of post. Each post shall receive one reinforcing stiffener.

2.2 MANUFACTURERS

A. Products and Manufacturers: Provide one of the following:
   1. Dynarail, by Fibergrate Composite Structures, Inc.
   2. SAFRAIL, by Strongwell Corporation.
   3. Or equal.

2.3 MATERIALS

A. Fiberglass-Reinforced Plastic (FRP):
   1. Premium-grade, fire-retardant vinyl ester resin with glass reinforcing.
   2. Finished surfaces of FRP items shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes, or un-reinforced areas. Glass fibers shall be well-covered with resin to protect against exposure due to wear and weathering.
   3. Fire Resistance: 25, ASTM E84, self-extinguishing ASTM D635.

B. Attachment, Clips, Fasteners, Rivets, and Hardware: Provide Type 316 stainless steel clips, bolts, nuts, washers, sleeves, fasteners, rivets, and associated hardware.

C. Color and Finish:
   1. Color: Safety Yellow.
   2. Finish: None.

D. Manufacturing Method:
   1. Handrails and railings shall be pultruded FRP components.

2.4 FABRICATION

A. Handrail and Railing – General:
   1. Use materials of minimum size and thickness as specified or indicated in the Contract Documents and in accordance with approved Shop Drawings and submittals.
   2. Posts and Tubes:
      a. Fabricate connection of handrail to post so that rails are unbroken and continuous through post without using of packs or splices.
      b. Install bottom rail through post at prepared hole made to fit outside dimensions of rail.
      c. Fit top rail into machined, U-shaped pocket formed into top of post such that rail is located at center of post.

d. For square cross-section members, exposed post corners shall be radiused to eliminate sharp edges.
e. Join rails to post through combination of bonding and riveting.
f. Sharp, protruding edges are unacceptable.

3. Support Post Attachments:
   a. Attach post bases according to the approved Shop Drawings, delegated design submittals, and manufacturer's recommendations.
   b. Reinforce post bases to a minimum height of 8.5 inches.
4. Rail Splices: Where required, splice rails using a 10-inch length of FRP tube bonded and riveted into place using epoxy adhesive, and rivets of material specified for fasteners.
5. Sealing: Coat shop-fabricated cuts in FRP with vinyl ester resin.

2.5 SOURCE QUALITY CONTROL

A. Fabrication Tolerances:
   1. Minimum Handrails and Railings Systems Plumb Criteria:
      a. Limit variation of completed handrail and railing system alignment to 1/4-inch in 12.0 feet.
      b. Posts shall be plumb to within 1/16-inch in 3.0 feet.
      c. Align rails so variations from level for horizontal members and from parallel with rake of stairs and ramps for sloping members do not exceed 1/4-inch in 12.0 feet.
   2. Provide "pencil-line" thin butt joints.

B. Tests:
   1. Load-test handrail and railing systems at the fabrication facility.
   2. Submit written report identifying and documenting testing methods used, loads imposed, and how and where loads were applied, and results of such testing on actual complete handrail and railing systems including anchors and fasteners to be used in the Work.
   3. Testing setup shall simulate actual conditions of installation to be used in the Work.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Installation – General:
   1. Remove protective wrapping from FRP handrails and railings immediately before installing materials.

2. Adjust handrails and railings prior to securing in place, to ensure proper matching at butting joints and correct alignment throughout their length. Plumb posts in each direction.
3 Installation Tolerances:
   a. Limit variation of cast-in-place inserts, sleeves and field-drilled anchor and fastener holes to the following:
      1) Spacing: Plus-or-minus 3/8-inch.
      2) Alignment: Plus-or-minus 1/4-inch.
      3) Plumbness: Plus-or-minus 1/8-inch.
   b. Minimum Handrails and Railings Systems Plumb Criteria:
      1) Limit variation of completed handrail and railing system alignment to 1/4-inch in 12.0 feet with posts set plumb to within 1/16-inch in 3.0 feet.
      2) Align rails so variations from level for horizontal members and from parallel with rake of stairs and ramps for sloping members do not exceed 1/4-inch in 12.0 feet.
   c. Provide “pencil-line” thin butt joints.
4. Secure posts and rail ends to buildings or structures as follows:
   a. Anchor posts in concrete by means of sockets set and anchored into the concrete floor. Provide closure secured to bottom of sleeve. Before installing posts, remove debris and water from sleeves. Provide reinforcing stiffeners in each post before installing post; do not install posts without reinforcing stiffeners. For non-removable handrail and railing systems sections, after posts have been inserted into sockets, fill the annular space between each post and socket solid with non-shrink grout in accordance with Section 03 60 00, Grouting. Crown grout and slope grout to drain away from posts.
   b. Anchor posts to stair stringers with stringer or support flanges, angle type or floor type as required by conditions, shop-connected to posts and bolted to supporting members. Flanges shall be as recommended by FRP handrail and railing manufacturer. Provide reinforcing stiffeners in each post before installing post; do not install posts without reinforcing stiffeners.
5. Use devices and fasteners recommended by FRP handrail and railing systems manufacturer and as shown or indicated on approved Shop Drawings.

B. Cutting, Fitting, and Placing:
   1. Perform cutting, drilling and fitting required for installation.
   2. Fit exposed connections accurately together to form tight hairline joints. Do not cut or abrade the surfaces of units that have been finished after fabrication, and are intended for field connections.
   3. Make permanent field-splice connections using blind rivets and manufacturer's recommended adhesive and five-inch minimum length connector sleeves. Tightly press-fit field splice connectors and install in accordance with the Contract Documents and manufacturer's written instructions. Comply with epoxy manufacturer's recommendations for requirements of installation and conditions of use. Provide two blind rivets per joint on 180-degree centers.

4. Make splices as near as possible to posts, but not more than 12 inches from nearest post.
5. Secure handrails to walls with wall brackets and end fittings as shown. Locate brackets as shown or, if not shown, at not more than five feet on ceneters.
6. Provide flush-type wall return fittings with the same projection as that shown for wall brackets. Drill wall plate portion of bracket to receive one bolt, unless otherwise shown or indicated.
7. Secure wall brackets to building or structure as follows:
    a. For concrete and solid masonry anchorage, use expansion shields and lag anchors, in accordance with Section 05 05 33, Anchor Systems.
    b. For hollow masonry anchorage, use toggle bolts having square heads.
8. Fasten toeboards in place with bolt hardware, not more than 1/4-inch clearance above floor level.

C. Expansion Joints:
1. Provide slip joint with internal sleeve extending two inches, minimum, beyond joint on each side.
2. Construct expansion joints as for field splices, except fasten internal sleeve securely to one side of rail only.
3. Locate joints within six inches of a post.

3.3 FIELD QUALITY CONTROL

A. Site Tests:
1. Load-test handrail and railing systems at the Site.
2. Submit written report identifying and documenting testing methods used, loads imposed, and how and where loads were applied, and results of such testing on actual complete handrail and railing systems including anchors and fasteners used in the Work.

+ + END OF SECTION + +

SECTION 06 82 53

FIBERGLASS-REINFORCED PLASTIC MISCELLANEOUS FABRICATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install fiberglass-reinforced plastic (FRP) miscellaneous fabrications. The Work also includes:
      a. Providing FRP miscellaneous fabrications to accommodate the Work under this and other Sections, attaching to FRP miscellaneous fabrications items such as fasteners, and all items required, including embedded angles, for which provision is not specifically included under other Sections.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before FRP miscellaneous fabrications Work.

C. Related Sections:
   1. Section 03 60 00, Grouting.
   2. Section 05 05 33, Anchor Systems.
   3. Section 05 50 13, Miscellaneous Metal Fabrications.
   4. Section 06 82 13, Fiberglass-Reinforced Plastic Grating.
   5. Section 06 82 23, Fiberglass-Reinforced Plastic Handrails and Railings.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AISC Manual for Steel Construction
   2. ANSI A14.3 Ladders – Fixed – Safety Requirements.
   3. ANSI/ASSE A1264.1, Safety Requirements for Workplace/Working Surfaces and Their Access; Workplace Floor, Wall and Roof Openings; Stairs and Guardrails Systems.
   4. ASTM D635, Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
   5. ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:

a. Manufacturer shall have a minimum of five years experience producing materials substantially similar to those required and shall be able to submit documentation of at least five installations in satisfactory operation for at least five years each.
b. Manufacturer shall be capable of preparing and submitting custom detail shop drawings for the materials required.

2. Installer:
a. Engage a single installer skilled, trained, and with record of successful experience in installing FRP miscellaneous fabrications systems in accordance with recommendations and requirements of manufacturer (or who can submit written acceptance by manufacturer), and who employs only tradesmen with specific skill and successful experience in the type of Work required.
b. Submit names and qualification to ENGINEER with the following information for at least three successful projects:
1) Names and telephone numbers of owner, architects, or engineers responsible for projects.
2) Approximate contract cost of FRP miscellaneous fabrications work.
3) Amount of FRP miscellaneous fabrications installed.

B. Component Supply and Compatibility:
1. Obtain all components for each type of system, such as ladders and cages, stairs and platforms, and structural shapes and framing and supports, each from a single FRP miscellaneous fabrications manufacturer.
2. FRP miscellaneous fabrications manufacturer shall prepare, or shall review and approve, all Shop Drawings and other submittals for components furnished under this Section.
3. Components shall be suitable for specified service conditions and shall be integrated into overall assembly by FRP miscellaneous fabrications manufacturer.

C. Regulatory Requirements: Comply with the following:
1. OSHA, 29 CFR 1910.23, Ladders.
2. OSHA, 29 CFR 1910.28, Duty to have fall protection and falling object protection.
3. OSHA, 29 CFR 1910.29, Fall protection systems and falling object protection.
4. Building codes referred to in Section 01 42 20, References.

D. Certification: Submit the following:
1. Verification that materials purchased for the Work comply with material designations specified in the Contract Documents and the approved Shop Drawings.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
1. Shop Drawings:

a. Drawings for fabricating and erecting FRP miscellaneous fabrications, indicating sizes of members, materials, components, and anchorage devices, based on requirements of the Contract Documents.
b. Show location of all anchorage items.
c. Profiles of FRP miscellaneous fabrications, and details of forming, jointing, sections, connection, internal supports, trim, and accessories. Provide details drawn at scale of 1.5-inch equal to one foot.
d. Custom details required for the Work under this Section.

2. Product Data:
a. Manufacturer's published literature, specifications, standard detail drawings for FRP miscellaneous fabrications.
b. Manufacturer's catalogs showing complete selection of standard and custom components and miscellaneous accessories for selection by ENGINEER.

B. Informational Submittals: Submit the following:
1. Certificates:
a. Certification on source of supply, in accordance with Article 1.3 of this Section.
2. Supplier Instructions:
a. Instructions for handling, storing, and installing materials furnished.
b. Templates for mounting to concrete or other existing materials.
3. Qualifications Statements: Submit qualifications for the following:
a. Manufacturer, when requested by ENGINEER.
b. Installer, when requested by ENGINEER. Qualifications statement shall include record of experience with references specified.

C. Closeout Submittals: Submit the following:
1. Operations and Maintenance Data: Submit maintenance manuals for materials furnished under this Section, including:
a. Comply with Section 01 78 23, Operations and Maintenance Data.
b. Detailed procedures for routine maintenance and cleaning, including cleaning materials, application methods, and precautions in using the materials that may be detrimental to finish when improperly applied.

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection:
1. Protect materials from corrosion, staining, scratching, and deterioration.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. System Description – General:

1. FRP miscellaneous fabrications shall be as shown and shall comply with recommended practices of the American Composites Manufacturers Association, except as otherwise specified in this Section.
2. FRP ladders and stairs shall include all components and features shown and specified. Provide system components and features necessary for a complete system complying with the Contract Documents.
3. Provide ultraviolet light inhibitor in the resin to improve materials' resistance to degradation from ultraviolet light.
4. Where appropriate, provide allowance for trimming and fitting at the Site.
5. Where applicable, comply with ANSI/ASSE A1264.1.

B. Design Criteria – Ladders:
1. Provide ladders suitable for concentrated live load at center of rung of not less than 1,200 lbs.

C. Design Criteria – Stairs and Platforms:
1. Stair and Platform Design Live Load: 100 psf.
2. Tread Design Loads: Concentrated live load shall be follows:
   a. 300 pounds on front five inches of tread at center of tread spans up to 5.5 feet.
   b. 300 pound on front 5.5 feet of tread at 1/3-points of tread span greater than 5.5 feet.
   c. Maximum Clear Span Deflection for Concentrated Live Loads: 1/240 of span, but no greater than 1/4-inch.

D. Design Criteria – Fasteners and Supports:
1. Provide the size, length and load carrying capacity required to carry the specified loadings required by design criteria multiplied by a minimum safety factor of four.
2. Where sizes are shown, the sizes shown shall be considered minimum. Increase size to comply with required design criteria loadings and minimum safety factor specified.
3. Anchors and Expansion Anchors: Comply with Section 05 05 33, Anchor Systems.

2.2 MATERIALS

A. Fiberglass-Reinforced Plastic (FRP):
1. Provide premium-grade, glass-reinforced, vinyl ester resin.
2. Fire Resistance: 25 or less, ASTM E84; self-extinguishing ASTM D635.
3. Surfaces that will receive foot traffic, including ladder runs and treads, shall have non-skid surface.

B. Manufacturing Method:
1. Pultrusion Method: FRP ladders, FRP stairs, FRP structural shapes, FRP miscellaneous framing and supports.

C. Attachment, Clips, Fasteners, Rivets, and Hardware: Provide Type 316 stainless steel clips, bolts, nuts, washers, sleeves, fasteners, rivets, and associated hardware.

2.3 FABRICATION

A. Shop Assembly: Preassemble items in the shop to the greatest extent possible, to minimize field splicing and assembly of components at the Site. Disassemble units only to extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinate installation.

B. FRP Ladders:
   1. Fabricate ladders for the locations shown with dimensions, spacing, details and anchorages as shown and specified. Comply with ANSI A14.3 and OSHA 29 CFR 1910.23, except as otherwise shown or specified. Comply with Laws and Regulations.
   2. Products and Manufacturers: Provide of one of the following:
      a. Dynarail Ladders, by Fibergrate Composite Structures, Inc. of StonCor Group.
      b. SAFRAIL Ladders, by Strongwell Corporation
      c. Ladders by IKG Industries, Division of Harsco Corporation.
   3. Ladders shall be fully shop-assembled. Ladder safety cages shall be test-assembled at the shop and drilled for proper field assembly.
   4. Side Rails:
      a. Unless otherwise shown, provide continuous FRP tubes, minimum of 1.75 inches square, with minimum wall thickness of 1/4-inch, spaced 1.5 feet apart, minimum.
      b. Unless otherwise shown or approved by ENGINEER, extend side rails 3.5 feet above the top rung, and return rails to wall or structure, unless other secure handholds are provided. If adjacent structure does not extend above top rung, goose-neck extended side rails back to the structure and securely attach to structure to provide secure ladder access
   5. Rungs:
      a. Provide square rungs, minimum of 1.25 inches square and minimum wall thickness of 1/4-inch, spaced at intervals of not more than 12 inches on centers, each with non-slip surface on the top of each rung.
      b. Distance from centerline of rungs to wall in behind ladder shall be not less than seven inches.
      c. Fit rungs in centerline of side rails. Secure each rung by epoxy bonding and with rivets.
   6. Support each ladder at top and bottom and at intermediate points spaced not more than five feet on centers.
   7. Ladder wall and floor mounts shall be fabricated FRP angles, 3/8-inch minimum thickness.
   8. Color: Safety Yellow.

C. FRP Stairs:
   1. Products and Manufacturers: Provide of one of the following:
      a. FRP Stairs by Fibergrate Composite Structures, Inc, of StonCor Group.

b. FRP Stairs by Strongwell Corporation
c. Or equal.

2. Provide FRP stairs complying with Laws and Regulations and OSHA 29 CFR 1910.27.
3. Fabricate stairs so that bolts and other fasteners do not appear on finish surfaces. Make joints true and tight, and make connections between parts light proof tight.
4. Construct stair units in compliance with sizes and arrangements shown. Provide framing, hangers, columns, struts, clips, brackets, bearing plates and other components for supporting stairs and associated platforms.
5. Provide brackets and bearing surfaces as detailed on the Drawings and as required to anchor and contain the stairs on the supporting structure.
6. Fabricate stringers of FRP channels, or plates, or a combination thereof, as shown or as required. Provide closures for exposed ends of stringers.
7. Construct platforms of FRP structural shapes and miscellaneous framing members, as shown or as required. Bolt framing members to stringers and headers.
8. Grating: Comply with Section 06 82 13, Fiberglass-Reinforced Plastic Grating.
9. Handrails and Railing: Comply with Section 06 82 23, Fiberglass-Reinforced Plastic Handrails and Railings.

D. FRP Platforms:
1. The platform shall be fabricated from FRP structural shapes properly sized to support the specified design live load.
2. The stair and platform shall be provided with FRP grating, railing as specified.

E. FRP Structural Shapes:
1. Products and Manufacturers: Provide of one of the following:
a. Dynaform Structural Shapes, by Fibergrate Composite Structures, Inc.
b. EXTREN Series 625 Structural Shapes, by Strongwell Corporation
c. Or equal.
2. Provide FRP miscellaneous structural framing required to complete the Work.
3. Fabricate FRP shapes to the sizes, shapes, and profiles shown, and as required to complete FRP framing Work.
4. Except as otherwise shown, fabricate from structural shapes, plates, and bars using mitered corners, brackets and splice plates and a minimum number of joints for field connection.
5. Cut, drill and tap units to receive hardware and similar items to be anchored to the Work.

F. Miscellaneous Framing and Supports:
1. Provide FRP miscellaneous framing and supports that are not part of structural FRP framework, as required to complete the Work.
2. Fabricate miscellaneous units to sizes, shapes, and profiles shown on the Drawings. If not shown, fabricate to required dimensions to receive adjacent grating, plates, storage tanks, doors, and other Work that will be located in, retained by, or supported by FRP framing or supports.

3. Except as otherwise shown or indicated, fabricate from FRP shapes, plates, and bars, of all-welded construction using mitered corners, welded brackets, and splice plates and minimum number of joints for field connection.
4. Cut, drill, and tap FRP miscellaneous framing and supports to receive hardware and similar items to be anchored to the Work.
5. Anchors:
    a. Provide FRP miscellaneous framing and supports with integrally-welded anchors for casting into concrete or masonry. Furnish inserts if FRP miscellaneous framing or supports are to be installed after concrete or masonry is placed.
    b. Except as otherwise shown or indicated, space anchors at maximum intervals of two feet on centers, and mount FRP units with the equivalent of 1.25-inch by 1/4-inch by eight-inch FRP strips, minimum. Provide larger mounting surface when required for the material or equipment being supported by the FRP miscellaneous farming or supports.
6. For grating requirements refer to Section 06 82 13, Fiberglass-Reinforced Plastic Grating.
7. For FRP handrails and railings, refer to Section 06 83 23, Fiberglass-Reinforced Plastic Handrails and Railings.

G. Grout: Provide non-shrink grout in accordance with Section 03 60 00, Grouting.

2.4 SOURCE QUALITY CONTROL

A. Fabrication Tolerances:
1. Limit variation of cast-in-place inserts, sleeves and field-drilled anchor and fastener holes to the following:
    a. Spacing: Plus-or-minus 3/8-inch.
    b. Alignment: Plus-or-minus 1/4-inch.
    c. Plumbness: Plus-or-minus 1/8-inch.
2. Provide “pencil-line” thin butt joints.

B. Tests:
1. Perform manufacturer's standard tests and inspections on FRP miscellaneous fabrications.
2. Materials and fabrication procedures shall be subject to inspection and tests in the mill, shop, and at the Site, conducted by qualified inspection agency. Such inspections and tests shall not relieve CONTRACTOR of responsibility for providing materials and fabrication procedures in accordance with the Contract Documents.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the substrate and conditions under which FRP miscellaneous fabrications Work is to be performed and notify ENGINEER in writing of unsatisfactory

tolerances that exceed specified limits and other conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION – GENERAL

A. Install FRP miscellaneous fabrications accurately in location, alignment, and elevation, plumb, level, true, and free of rack, measured from established lines and levels. Brace temporarily or anchor temporarily in formwork where fabrications are to be built into concrete, masonry, or other construction.

B. Perform cutting, drilling and fitting required for the installation of FRP miscellaneous fabrications. Do not cut FRP members without approval of FRP manufacturer and ENGINEER. When FRP members are cut, seal the cut area with sealant recommended by FRP manufacturer.

C. Fit exposed connections accurately together to form tight, hairline joints. Field assemble with fasteners, clips, rivets, and other hardware as required.

D. Anchorage Devices:
   1. Provide anchorage devices, including anchor bolts, and other connectors required for securing FRP miscellaneous fabrications to floors, walls, and other in-place Work.
   2. Anchor securely as shown and as required for the intended use, using concealed anchors where possible
   3. Provide templates and other devices necessary for presetting anchorage devices to accurate locations.
   4. Refer to Section 05 05 33, Anchor Systems, for anchorage requirements.

E. Setting Bases and Bearing Plates:
   1. Clean concrete bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of FRP bearing plates and FRP base plates.
   2. Set loose and attached FRP base plates and FRP bearing plates for structural members or FRP supports on wedges or other adjusting devices.
   3. Tighten anchorage devices after supported members are positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of FRP base or FRP bearing plate prior to packing with grout.
   4. Place grout between bearing surfaces and bases or plates in accordance with Section 03 60 00, Grouting. Finish exposed surfaces, protect installed materials, and allow to cure in accordance with grout manufacturer's instructions, and as otherwise required.
   5. Leveling plates and wood wedges are not allowed.

F. Installation Tolerances:
   1. Limit variation of cast-in-place inserts, sleeves and field-drilled anchor and fastener holes to the following:
      a. Spacing: Plus-or-minus 3/8-inch.

b. Alignment: Plus-or-minus 1/4-inch.
c. Plumbness: Plus-or-minus 1/8-inch.

2. Provide “pencil-line” thin butt joints.

G. Protection: Protect cast-in sleeves from debris and water intrusion by use of temporary covers or removable foam inserts.

3.3 INSTALLATION OF FRP LADDERS

A. Attach ladder brackets to base as shown. Install ladders in accordance with FRP ladder manufacturer's instructions.

3.4 INSTALLATION OF FRP STAIRS AND PLATFORMS

A. Installation of FRP Stairs and Platforms – General:
1. Erect FRP stair Work to line, elevation, plumb, square, and true with runs registering level with floor and platform levels.
2. Erect FRP platforms to line, elevation plumb, square, level, and true.
3. Provide anchorage devices, connectors, and fasteners where necessary for securing stairs and platforms to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts and other connectors as required.

3.5 INSTALLATION OF FRP STRUCTURAL SHAPES

A. Field Assembly:
1. Set FRP structural shapes and members accurately to the lines and elevations shown and indicated. Align and adjust the various shapes and members forming part of a complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
2. Level and plumb individual shapes and members of structure within tolerances as specified in AISC Manual for Steel Construction. For shapes or members requiring accurate alignment, provide clip angles, lintels, and other members, with slotted holes for horizontal adjustment at least 3/8-inch in each direction, or more when required.
3. Splice members only where shown or indicated.

B. Connections:
1. Comply with AISC Manual for Steel Construction, as applicable, for bearing, adequacy of temporary connections, and alignment.
2. Where holds in shapes or members are inadequately sized, address and make sufficiently large using means recommended by manufacturer of FRP shape or member.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections: All elements of completed FRP miscellaneous fabrications shall be visually inspected by CONTRACTOR, installer, and ENGINEER. Correct defective Work, and correct Work not installed to true line, elevation, and grade.

+ + END OF SECTION + +

SECTION 07 11 13

BITUMINOUS DAMPPROOFING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install bituminous dampproofing.
   2. Extent of bituminous dampproofing is shown.
   3. Types of products required include the following:
      a. Cold-applied asphalt semi-fibrated, water emulsion, Asbestos-free dampproofing, for exterior structure and wall surfaces above- and below-grade.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before bituminous dampproofing Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM D1187, Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
   2. ASTM D1227, Specification for Emulsified Asphalt Used as Protective Coating for Roofing.
   3. ASTM D4479, Specification for Asphalt Roof Coatings—Asbestos-Free.
   4. ASTM D4586, Specification for Asphalt Roof Cement, Asbestos-Free.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Installer: Engage a single installer with successful experience installing bituminous dampproofing, and that is acceptable to or licensed by manufacturer of bituminous dampproofing materials, and that employs only workers with specific skill and successful experience in the type of Work required.

B Component Supply and Compatibility:
   1. Provide all bituminous dampproofing of each type required produced by one manufacturer.

C. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Schedule of all Project-specific surfaces where bituminous dampproofing will be applied.
   2. Product Data:
      a. Manufacturer's specifications and technical data for each required dampproofing material. Indicate VOC content of materials proposed.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Submit bituminous dampproofing manufacturer's certification or other data substantiating that materials proposed for use comply with the Contract Documents, and are recommended by bituminous dampproofing manufacturer for the required applications.
      b. Certification indicating compliance with Laws and Regulations for air quality regarding maximum VOC content for bituminous dampproofing materials.
      c. Certification that materials furnished is Asbestos-free as required by ASTM D4479 and ASTM D4586.
   2. Supplier’s Instructions:
      a. Manufacturer’s instructions for handling and storing.
      b. Manufacturer's instructions for application methods and application procedures.
   3. Qualifications Statements:
      a. Installer: Submit copy of manufacturer’s acceptance of installer and installer’s record of experience in work similar to that required under this Section.

1.5 DELIVERY, STORAGE AND HANDLING

A. Storage of Materials:
   1. Store emulsions at temperatures above 40 degrees F.

1.6 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Do not install bituminous dampproofing when ambient air temperature is 40 degrees F or less.
   2. Do not apply bituminous dampproofing materials to frozen substrates or to substrate in condition not complying with bituminous dampproofing material manufacturer’s recommendations.
   3. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until

dampproofing has cured.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General:
   1. For interior and concealed-in-wall uses, provide bituminous dampproofing material that is odor-free after drying for 24 hours.

B. Cold-Applied Asphalt Emulsion Dampproofing:
   1. Asphalt Emulsion: Manufacturer's standard asphalt and water emulsion, recommended by bituminous dampproofing material manufacturer for below-grade exterior and above-grade interior applications to either damp (green) or dry substrates, compounded to penetrate the substrate and build to a moisture-resistant, breathing-type of elastic coating.
   2. VOC Content: Zero 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Semi-Fibrated, Semi-Mastic Emulsion Dampproofing Material:
      a. Provide semi-fibrated, semi-mastic, emulsion type, brush-applied, dampproofing compound complying with ASTM D1227, Type II, Class I.
      b. Products and Manufacturers: Provide one of the following:
         1) Sealmastic Type II by R. W. Meadows, Incorporated.
         2) 220 AF Fibered Emulsion Dampproofing, by Karnak Corporation.
         3) Or equal.

2.2 AUXILIARY MATERIALS

A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

B. Board Insulation: Refer to Section 07 21 05.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the substrates and conditions under which bituminous dampproofing Work will be applied, and advise ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. General:

1. Do not proceed with bituminous dampproofing Work until blocking, nailers, piping, conduits, and other projections through the substrate are installed, with substrate properly patched and sealed or flashed to receive the bituminous dampproofing.

B. Surface Preparation:
   1. Remove from the substrate dirt, oil, loose materials, and other substances that interfere with penetration, bond, and performance of bituminous dampproofing materials.
   2. Dampen with water surfaces that are dry and are to receive application of bituminous dampproofing. Keep such surfaces damp ahead of application.
   3. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

3.3 INSTALLATION- GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before proceeding with other Work unless more stringent requirements are indicated.
   1. Apply dampproofing to provide continuous plane of protection.
   2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

B. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
   1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
   2. Lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Masonry Backup for Brick Veneer Assemblies: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft.

3.5 INSTALLATION OF INSULATION BOARD

A. Where indicated, install insulation board over completed-and-cured dampproofing. Refer to section 07 21 05, Building Insulation.

3.6 CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

3.7 PROTECTION OF EXECUTED WORK

A. Protect other work from spillage of bituminous dampproofing materials, and prevent such materials from penetrating and clogging drains, conductors, and other utilities.

B. Remedy damage to other construction that is soiled or otherwise damaged during installation of bituminous dampproofing.

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SECTION 07 19 16

SILANE WATER REPELLENTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install silane water repellents.
   2. Extent of surface-applied silane water repellents includes all exterior brick unit masonry.
   3. Types of silane water repellents required include:
      a. Liquid, colorless, non-gloss-producing, VOC-compliant, applied water repellent.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before silane water repellents Work.
   2. Coordinate water repellent provided with sealant. Water repellent and sealant shall be compatible with each other.

C. Related Sections:
   1. Section 04 00 05, Masonry.

1.2 QUALITY ASSURANCE

A. Qualifications:
   1. Installer:
      a. Water repellent applicator shall be acceptable to or licensed by water repellent manufacturer and shall be regularly engaged in installing water repellent products and work similar to the Work required under this Section.

B Component Supply and Compatibility:
   1. Provide all water repellents of each type required produced by one manufacturer.

C Regulatory Requirements:
   1. VOC emissions from water repellent materials shall not exceed 50 g/L.

D. Mock-up:
   1. Prior to installing materials required under this Section, apply silane water repellent to area acceptable to ENGINEER on mock-up up required under Section 04 00 05, Masonry.

2. Mock-up shall indicate, relative to silane water repellents, proposed range of color change, surface sheen, and workmanship to be expected in the completed Work. Obtain ENGINEER's approval of visual qualities of mock-up before starting unit masonry construction and silane water repellents Work.
3. Provide as many mock-up panels as required to obtain ENGINEER's approval.
4. Water repellent application that does not comply with standards approved on mock-up panels shall be removed and reapplied to comply with the Contract Documents.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data:
      a. Manufacturer's literature and specifications on products proposed for use. Indicate VOC emissions of materials.
      b. Detailed chemical analysis and test results of previously-performed tests of materials required under this Section applied to surfaces identical to, or similar to, those to which silane water repellents will be applied for the Project.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Manufacturer's certification indicating silane water repellent complies with or exceeds requirements of the Contract Documents.
   2. Supplier's Instructions:
      a. Manufacturer's instructions for handling, storing, and shelf-life.
      b. Manufacturer's instructions for methods and application procedures.
   3. Qualifications Statements:
      a. Installer: Submit copy of manufacturer's acceptance of installer and installer's record of experience in work similar to that required under this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's instructions for handling, storing, and shelf-life.

1.5 SITE CONDITIONS

A. Environmental Conditions for Installation:
   1. Comply with manufacturer's installation instructions regarding required temperature of surface to which material is applied.
   2. Do not apply water repellent when ambient air temperature is lower than 400 degrees F.
   3. Do apply materials when ice or frost covers the substrate.
   4. Do apply materials when ambient temperature of surface exceeds 100 degrees F.
   5. Do apply materials in rainy conditions or when heavy rain is expected with four hours after application.

6. Maintain ambient temperature above 20 degrees F during 24 hours after installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Products and Manufacturers: Provide one of the following:
   1. Prime-A-Pell Plus Series 663, by Tnemec Company, Inc.
   2. SL100 Water Repellent, by PROSOCO, Inc.
   3. Baracade Silane 100C, by Euclid Chemical Company.
   4. Or equal.

2.2 MATERIALS

A. Chemical Bonding Water Repellents Without Silicone Resin:
   1. Provide silane solution, with or without diffused quartz carbide; colorless, and VOC-compliant.
   2. When dry, water repellent shall be colorless and without gloss.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine under which the Work will be performed. Notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

B. Verify that surfaces to receive water-repellent are clean, and free of efflorescence, stains, oil, grease, and other foreign matter detrimental to application.

C. Verify that required sealants have been installed in areas to receive water repellent.

3.2 PREPARATION

A. Protection of Adjacent Surfaces:
   1. Protect adjacent surfaces that will not receive silane water repellents. When applied or splashed onto surfaces not required to receive water repellents, remove immediately, using method recommended by water repellent manufacturer. Maintain cleaning materials available at the Site for immediate use.

B. Surface Preparation:
   1. Remove loose particles and foreign matter. Remove grease and oil using solvent, effective alkaline cleaner, or detergent as instructed by water repellent manufacturer. Scrub surfaces with water.

2. Surfaces shall be dry prior to applying water repellent.

3.3 APPLICATION

A. Provide water repellents in accordance with water repellent manufacturer's instructions and recommendations.

B. Apply in two continuous, uniform coats as recommended by water repellent manufacturer. Allow to dry between coats as recommended by water repellent manufacturer.

C. Protect materials in vicinity of application. During windy conditions, do not apply water repellent by spraying. When plants and other flora receive water repellent coating, immediately remove water repellent from plants and flora by washing.

3.4 FIELD QUALITY CONTROL

A. Site Tests:
   1. Spray Test: After water repellent has dried, spray with water the surfaces to which water repellent was applied. After surfaces have adequately dried, inspect for signs of water adsorption in presents of ENGINEER, and reapply water repellent to areas that indicate water absorption.

+ + END OF SECTION + +

SECTION 07 21 05

BUILDING INSULATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install building insulation.
   2. Extent of each type of building insulation is shown and indicated in the Contract Documents.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before building insulation Work.

C. Related Sections:
   1. Section 05 40 00, Cold-Formed Metal Trusses and Framing.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM C177, Test Methods for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
   2. ASTM C203, Test Method for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.
   3. ASTM C236, Test Methods for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box.
   4. ASTM C272, Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
   5. ASTM C303, Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation.
   6. ASTM C518, Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
   7. ASTM C520, Test Methods for Density of Granular Loose Fill Insulation.
   8. ASTM C531, Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars and Monolithic Surfacings.
   9. ASTM C549, Specification for Perlite Loose Fill Insulation.
   10. ASTM C553, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
   11. ASTM C578, Specification for Rigid, Cellular Polystyrene Thermal Insulation.

12. ASTM C612, Specification for Mineral Fiber Block and Board Thermal Insulation.
13. ASTM C665, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
14. ASTM C764, Specification for Mineral Fiber Loose-Fill Thermal Insulation.
15. ASTM D696, Test Method for Coefficient of Linear Thermal Expansion of Plastics between -30 Degrees C and 30 Degrees C with a Vitreous silica dilatometer.
16. ASTM D1621, Test Method for Compressive Properties of Rigid Cellular Plastics.
17. ASTM D2126, Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
18. ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.
19. ASTM E96, Test Methods for Water Vapor Transmission of Materials.
20. ASTM E119, Test Methods for Fire Tests of Building Construction and Materials.
21. UL 1479, Fire Tests of Through-Penetration Firestops.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturers:
      a. Obtain building insulations, requiring hydrochlorofluorocarbon blowing agent from manufacturer(s) that manufacture product required using blowing agent acceptable for use until the year 2020 and complying in all respects with Copenhagen Amendments to the Montreal Protocol.
      b. Manufacturer shall provide complete technical services including preparation and review of Shop Drawings and submittals, installation methods, and proposed detailing for the Work.
   2. Installer: Engage single installer for each type of building insulation. Each installer shall be skilled, trained, and have record of successful experience in applying and installing each product, and possess successful record of performing work in accordance with recommendations and requirements of manufacturer or that can submit written evidence of being acceptable to manufacturer for providing the required Work. Installers shall employ only tradesmen with specific skill and successful experience in each type of Work required. Submit to ENGINEER name and qualifications of each installer with the following information for at least three successful, completed projects per installer:
      a. Names and telephone numbers of owner and architect or engineer responsible for each project.
      b. Approximate contract cost of the building insulation system installed.
      c. Quantity (area) of building insulation installed.

B. Regulatory Requirements: Comply with code interpretations by authorities having jurisdiction at the Site.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings showing extent of the building insulation Work and all details required for the Work, referencing system components provided as Samples.
   2. Product Data:
      a. Material specifications and general recommendations from building insulation manufacturer for each type of building insulation product. Include manufacturer's data substantiating that materials comply with Contract Documents.
      b. Test Reports: Copies of reports of tests on materials being furnished or previously-manufactured, identical materials verifying compliance with physical properties and environmental features specified in the Contract Documents. When requested by ENGINEER, submit qualifications and summary of experience of testing agencies in performing tests similar to those required.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions: Manufacturer's installation instructions. Indicate by copy of transmittal form that installer has received copy of manufacturer's installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling of Materials:
   1. Do not deliver insulation materials to the Site before the time of installation.
   2. Deliver materials in sufficient quantities to allow uninterrupted continuity of the Work.
   3. Handle materials carefully to avoid damage and breakage or compressing of boards to less than their specified thickness, or other damage.
   4. Handle materials in manner that prevents inclusion of foreign materials.
   5. Conform to Section 01 65 00, Product Delivery Requirements.

B. Storage of Materials:
   1. Store materials in dry, enclosed area, off ground and away from possible contact with water, ice, and snow.
   2. Prevent damage to materials during storage, including minimizing the time materials are stored at the Site before being incorporated into the Work. Store only sufficient quantity of building insulation materials at the Site required for continuous advancement of the Work without causing delay.
   3. Conform to Section 01 66 00, Product Storage and Handling Requirements.

1.6 SITE CONDITIONS

A. Environmental Conditions:
   1. Complete the installation and concealment of building insulation materials as

rapidly as possible to avoid damage from adjacent construction operations and adverse weather conditions.

2. Install building insulations when weather and temperature conditions comply with building insulations manufacturers' written recommendations.
3. Install building insulations when damaging environmental condition are not forecasted for the time when exposed systems materials components would be exposed to potential damage from the elements.
4. Protect building insulation Work from precipitation, frost, and direct sunlight.
5. Do not apply pressure-sensitive tape when temperature is below 35 degrees F or above 110 degrees F.
6. Record decisions, conditions, and agreements to proceed with the Work when weather conditions may be unfavorable. State reasons for proceeding, along with names of persons involved, and changes or revisions (if any), if required, to allow the Work to proceed.

1.7. SCHEDULING

A. Proceed with building insulation Work when preceding Work is ready to receive the Work of this Section.

B. Proceed with building insulation and associated Work after curbs, blocking, substrate board, nailer strips, vents, drains and other projections through the substrates have been installed, and when substrate construction and framing of openings is complete.

C. Proceed with and complete the Work when materials, equipment and tradesmen required for the installation of building insulation and backfilling operations are at the Site and ready to follow with the Work in manner that does not leave the Work vulnerable to damage or deterioration.

D. Do not advance installation of building insulation beyond that necessary for proper sequencing of the Work. Do not advance the Work when there is no proper and secure protection from damaging weather and construction activities.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Performance Criteria:
   1. Thermal Conductivity: Thicknesses shown are for thermal conductivity, k-value at 75 degrees F, specified for each material.
   2. Provide adjusted thicknesses based on thicknesses shown or specified for building insulations, as required to comply with required thermal resistances for material having different thermal conductivity.

2.2 MATERIALS

A. Glass Fiber Insulations: Provide the following types:

1. General: Provide insulations formed from glass fibers and resinous binders fabricated into flexible blankets, semi-rigid and rigid sheets complying with ASTM C665, ASTM C553, and ASTM C612.
2. Flame-resistant Vapor Barrier Faced Batt Insulation: Provide thermal batt insulation, faced on one side with foil-reinforced-kraft laminate vapor barrier complying with ASTM C665, Type III, Class A.
    a. Physical Properties:
        1) Thermal Conductivity (k), ASTM C518: 0.33 Btu/inch/hour/square foot/degree F maximum.
        2) Density, ASTM C303: 1.5 pounds per cubic foot (pcf).
        3) Water Vapor Transmission, ASTM E96: 0.10 perm/inch.
        4) Flame Spread, ASTM E84: 25.
        5) Smoke Developed, ASTM E84: 50.
        6) Fuel Contributed, ASTM E84: 50.
    b. Thickness: 12.5 inches minimum.
    c. R-Value: R-38 minimum.
    d. Width: 16", 24" or a combination of sizes, depending on spacing of roof trusses. Coordinate with Section 05 40 00, Cold-Formed Metal Trusses and Framing.
    e. Products and Manufacturers: Provide one of the following:
        1) PINK Next Gen Faced Thermal Batt Insulation by Owens-Corning Fiberglass Corporation.
        2) Thermal Batt Insulation by Johns Manville.
        3) Or equal.

B. Foam Plastic Insulations: Provide the following types:
1. General: Rigid, closed-cell, thermally stabilized, extruded, hydrochlorofluro-carbon blown, foam board insulation consisting of 100 percent virgin extruded polystyrene modified resin complying with ASTM C578.
2. Provide blowing agent with lowest available ozone depletion potential, such as HCFC-142b or better. HCFC-141b is not acceptable.
3. Under-slab Insulations: Provide very high-load-resisting, rigid foam board insulation complying with ASTM C578, Type V.
    a. Physical Properties: Provide the following:
        1) Thermal Conductivity (k), ASTM C177 and ASTM C518: 0.20 Btu/inch/hour/square foot/degree F.
        2) Compressive Strength (psi at five percent deformation) ASTM D1621: 100 psi minimum.
        3) Flexural Strength, ASTM C203: 100 psi minimum.
        4) Coefficient of Thermal Expansion, ASTM D696: 3.5x10^5 inches/inch/degree F.
        5) Water Absorption, ASTM C272: Less than 0.1 percent by volume maximum.
        6) Water Vapor Permeance, ASTM E96: 0.3 to 0.8 perms/inch maximum.
        7) Flame Spread, ASTM E84: Five.
        8) Smoke Developed, ASTM E84: 165 maximum.
    b. Thickness: One layer each two inches thick.

c. Width: 2.0 feet.
d. Length: 8.0 feet.
e. Products and Manufacturers: Provide one of the following:
1) STYROFOAM 100 HIGH LOAD by the Dow Chemical Company.
2) Foamular 1000 by Owens-Corning Fiberglass Corporation.
3) Or equal.

4. Cavity Wall Rigid Insulation Board: Provide the following:
a. Rigid, rectangular boards of extruded polystyrene complying with ASTM C578, Type X and IV.
b. Physical Properties: Provide the following:
1) Minimum Compressive Strength, (at 10 percent deformation), ASTM D1621: 25 psi.
2) Flame Spread, ASTM E84: 10 maximum.
3) Smoke Development, ASTM E84: 165 maximum.
4) Vapor Transmission, ASTM E96: 1.1 perms/inch.
5) Thermal Resistance, ASTM C177: 5.0 per inch.
6) Maximum Water Absorption, ASTM C272: 0.10 percent by volume.
c. Size: One layer of 16 inches by 96 inches by 2-1/8" inches thick.
d. Products and Manufacturers: Provide one of the following:
1) CAVITYMATE Ultra by the Dow Chemical Company.
2) FOAMULAR High-R CW Plus by Owens-Corning Fiberglass Corp.
3) Or equal.

C. Miscellaneous Materials and Accessories: Provide the following:
1. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer, and complying with fire resistance requirements.
2. Mechanical Anchors: Type and size shown or, if not shown, as recommended by insulation manufacturer for type of application shown and condition of substrate.
3. Safing Impaling Clips: Provide galvanized steel impaling clips complying with requirements of code authorities having jurisdiction at the Site and as recommended by insulation manufacturer for full system responsibility.
4. Adhesive Tapes: Complete selection of insulation manufacturer's recommended taping materials.
5. Bitumen: Asphalt, ASTM D 449.

PART 3 – EXECUTION

3.1 INSPECTION

A. CONTRACTOR and installer shall examine substrate and conditions under which building insulation Work will be performed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surfaces to receive building insulation shall be clean of all debris, dirt, and other contamination before installation begins.

3.3 INSTALLATION

A. General:
   1. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to Site conditions, before proceeding with the Work obtain from manufacturer and submit to ENGINEER specific installation recommendations from manufacturer.
   2. Extend insulations full thickness over entire surface to be insulated. Cut and fit tightly around obstructions. Fill voids with insulation.
   3. Apply number of layers of insulation specified, each of required thickness, or required thickness to provide thermal value shown or indicated in the Contract Documents, to make up the total thickness.

B. Unit-type Building Insulation:
   1. Apply insulation units of type shown or indicated to substrate by method indicated. If not otherwise indicated and except for units resting on horizontal surfaces, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
   2. Set vapor barrier faced units with vapor barrier to warm side of construction, (usually toward inside), except as otherwise shown or indicated. Do not obstruct ventilation spaces, except for fire-stopping.
   3. Tape joints and ruptures in vapor barriers using adhesive tape of type recommended by insulation manufacturer, and seal each continuous area of insulation to surrounding construction so as to ensure vapor-tight installation of the units.

C. Board-type Perimeter and Under-Slab Insulation:
   1. Install perimeter insulation after concrete footings have been poured and before on-grade concrete slab work begins.
   2. Remove projections that interfere with placing.
   3. Apply single 2.0-foot-wide continuous band of insulation of required thickness and number of layers at slab-on-grade buildings whether or not shown. Stagger joints between layers of insulation and butt insulation tightly together.
   4. Protect top surface of horizontal insulation from damage during concrete Work by applying protection course material recommended by insulation manufacturer.
   5. On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions. Use type of adhesive recommended by manufacturer of board-type perimeter insulation.
   6. Tape bottom edge of insulation before temporarily attaching insulation to wall with mastic.
   7. Tape all joints in vertical wall insulation.

8. Protect insulation on vertical surfaces from damage during backfilling by applying protection course material recommended by insulation manufacturer. Set in adhesive in accordance with recommendations of insulation manufacturers and protection course material.

D. Cavity Wall Rigid Insulation Board:
   1. Install exterior wall rigid insulation board after all concrete unit masonry Work is complete.
   2. Apply single layer of insulation cut to fit snugly and uniformly and in continuous contact with edges of continuous masonry horizontal joint reinforcement over entire plane of the wall.
   3. Apply exterior wall rigid insulation to exterior concrete unit masonry walls in areas shown or indicated as receiving masonry outer cavity wall wythes.

E. Batt-type Insulation:
   1. Install batt insulation above ceilings and between studs and rafters as shown. Extend insulation full width, length, and height in areas shown.
   2. Fit tightly around obstructions to form uniform, insulated barrier.

F. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
   2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

G. Correcting Defective Work:
   1. System components that are dislodged, damaged, expanded, broken, penetrated, or crushed by subsequent installation operations or damaged by detrimental weather shall be immediately replaced with undamaged material in compliance with the Contract Documents and properly protected as specified.
   2. Only original installer shall repair or replace deteriorated or defective Work.

3.5 PROTECTION

A. Protection from Elements:
   1. Protect all components of the Work from detrimental weather conditions. Do not allow building insulation materials to become wet or soiled, or covered with ice or snow. Provide continuous protection of materials against damage, wetting and moisture absorption and storing materials as specified
   2. Work that cannot, for reasons acceptable to ENGINEER, be covered with complete construction system before onset of weather detrimental to the Work, shall be completely covered and protected in manner that deflects precipitation from building insulations without damaging adjacent Work.

B. Protection During Construction:
   1. Protect all components of the Work from construction operations including, but not limited to, backfilling, framing, and sheathing, aluminum siding, and

concrete unit masonry Work, until work is completed and acceptable to ENGINEER.

2. Protect building insulations from damage and abuse by other contractors and installers until readiness for final payment.
3. Do not allow building insulations to come into contact with welding operations or other fire or ignition sources.
4. Do not allow construction traffic not associated with installation of building insulation in the area of building insulation Work. Protect the area from access by other installers and contractors until the building insulation Work has been incorporated into finished construction systems.

C. Building insulation that becomes wet, damaged, or deteriorated shall be promptly removed from the Site and replaced with materials conforming to this Section.

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SECTION 07 41 13

METAL ROOF PANELS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals required to furnish and install preformed, metal roof panels as shown and specified. The Work also includes:
      a. Providing openings in metal roof panels to accommodate the Work under this and other Sections and building into the preformed metal roof panels all items such as sleeves, inserts and all other items to be embedded in preformed metal roof panels for which placement is not specifically provided under other Sections.
   2. The extent of preformed, metal roof panel Work is shown and is defined to include exterior preformed, prefinished metal roofing, cap and drip flashings, metal closures and all other associated trim and accessories.
   3. The types of preformed, metal roof panel Work required include the following:
      a. Preformed metal roof panels.
      b. Snow Guards.
      c. Miscellaneous fasteners, trim, flashings, closures, and accessories.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or embedded in, the preformed prefinished roof panels.

C. Related Sections:
   1. Section 05 05 33, Anchor Systems.
   2. Section 07 21 05, Building Insulation.
   3. Section 07 71 00, Roof Specialties.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. AAMA 2605, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
   2. AAMA 621, Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates.
   3. ASTM A 167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

4. ASTM A 653, Specification for Steel Sheet, Zinc-Coated, (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
5. ASTM C 645, Specification for Nonstructural Steel Framing Members
6. ASTM D 2244, Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
7. ASTM E 1980, Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
8. FM Global Loss Prevention Data Sheets, 1-29, Above Deck Roof Components.
9. UL, Building Materials Directory.
10. UL 580, Tests for Uplift Resistance of Roof Assemblies.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide company specializing in architectural sheet metal products with a minimum of ten years of experience.

B. Installer Qualifications:
   1. Engage a single installer regularly engaged in preformed metal roof panel installation and with experience in the erection of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to ENGINEER.

C. Component Supply and Compatibility: Obtain all preformed, metal roof panels and accessories from the same manufacturer.

D. Requirements of Regulatory Agencies:
   1. 2020 New York State Building Code.
   2. Underwriters Laboratories requirements for roof deck constructions which are rated "UL Class A".
   3. Factory Mutual requirements for "Class 1-90" rated construction, for wind resistance.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Copies of manufacturer's specifications, standard and custom detail drawings, and installation instructions for preformed metal roof panels, supports and trim. Submit manufacturer's standard warranty on factory-applied finish of preformed metal roofing panels.
      b. Profiles of preformed prefinished roofing panel units, and the details of forming, jointing, gaskets (if any), supports, anchorages, trim, flashing, and accessories. Show details of weatherproofing at edges, terminations, and penetrations of the preformed prefinished roof panel Work. Show 1/4-inch to the foot scale layout and elevations of entire Work. Show all details at 3-inch to the foot scale, indicating all internal components and intersection members, details, and special fabrication techniques.

2. Samples:
    a. Samples of each type of preformed metal roof panel and trim complete with factory-applied finish, two foot long by full-width. Samples will be reviewed by ENGINEER for pattern, texture and color only. Compliance with other requirements is the exclusive responsibility of CONTRACTOR.
    b. One of each type fastener employed, with statement of intended use. Samples will be reviewed by ENGINEER for material and color only. Compliance with other requirements is the exclusive responsibility of CONTRACTOR.
    c. Complete selection of manufacturer's standard and custom colors.

B. Informational Submittals: Submit the following:
1. Certificates:
    a. Provide written certification to the ENGINEER from the coil manufacturer verifying that the coil to be used for on-site roll forming is compatible with the roll forming machinery that will be used.
2. Test Reports: Submit for approval certified laboratory tests reports for required products:
    a. High-Performance Organic Finish.
3. Source Quality Control Submittals:
    a. Submit results of testing.
4. Site Quality Control Submittals:
    a. Submit results of testing and inspection performed in the field by Manufacturer's technical representative.
5. Qualification Statements
    a. Installer's qualifications.

C. Closeout Submittals: Submit the following:
1. Warranty Documentation:
    a. Submit manufacturers and CONTRACTOR'S written warranties as specified, herein.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:
1. Deliver preformed metal roof panels and all accessories dry and undamaged, with manufacturer's protective coating intact.
2. Deliver preformed metal roof panels in bundles with banded wood surrounds and end caps intact.

B. Storage of materials:
1. Store preformed prefinished roof paneling and accessory materials in a manner that will protect the panels from exposure to sun and condensation, with good air circulation around each piece.
2. Store preformed prefinished roof paneling and accessory materials in an area protected from dirt, damage, and weather.

3. Do not store in contact with concrete or other materials that might cause corrosion.

C. Handling of Materials:
   1. Do not subject preformed prefinished roof paneling 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.

1.6 JOB CONDITIONS

A. Scheduling:
   1. Coordinate metal roof panel Work with flashing, trim, and the construction of decks, and other adjoining work, to provide a permanently watertight, leak-proof, secure and non-corrosive installation.
   2. Deliver materials to the Site in sufficient quantities to ensure uninterrupted progress of the Work.
   3. Schedule the installation of metal roof panels to coincide with the installation of waterproofing, drains, piping, blocking, nailers, reglets, framing at openings, curbs, parapets and other adjoining and substrate Work.
   4. Proceed with and complete the Work only when materials, equipment, and knowledgeable tradesmen, required for the installation of roof specialties, are at the Site and are ready to follow, and integrate metal roof panel Work with flashing Work, in order to maintain watertight conditions.

1.7 WARRANTIES

A. Provide manufacturer's standard warranty on the coil coated polyvinylidene fluoride-based coating specified, herein.

B. Guarantee that the polyvinylidene fluoride-based coating meets all criteria specified and will not spall, check, craze, peel or otherwise lose adhesion for a period of twenty years from the date of Final Acceptance, to the extent that such shall create unsightly conditions or otherwise impair the intended architectural qualities of the building.

C. In the event that the coil coated polyvinylidene fluoride-based coating fails to meet the specified standards the manufacturer shall, at their own expense, replace or field paint, at the direction of the ENGINEER, all areas affected by the failure. In the event that repainting is selected, it shall be done at mutually agreeable intervals throughout the term of the warranty.

D. The warranty does not apply where failure is caused by accidents, or external conditions or forces beyond the control of the manufacturer.

E. Provide a written guarantee agreeing to replace preformed metal roof panel Work which fails in material or workmanship within one year of the date of Final Acceptance. Failure of materials or workmanship shall include, but is not limited to,

deterioration in excess of normal weathering and lack of water or weather tightness. Imperfections, by reason of defective materials, workmanship or arrangement of the various parts shall be made good to the satisfaction of the OWNER, at the CONTRACTOR'S expense.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Criteria:
   1. Provide preformed, prefinished roofing panels, framing and accessories that comply with the following minimum performance characteristics:
      a. Wind loading: 126 miles per hour, unless heavier loading is required by the 2020 New York State Building Code.
   2. Anchorage system shall be designed so that panels are free to move for expansion and contraction and so that individual panels may be removed without disturbing adjacent panels.
   3. Form panels in lengths, as required.
   4. Solar Reflectance Index: Not less than 78 for a low slope roof of 2:12 or less and 29 for a steep slope roof of over 2:12 pitch when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

2.2 MATERIALS

A. Preformed Prefinished Metal Roof Panels:
   1. Custom-fabricated, roll-formed, 22 gauge minimum, but in no case lighter than required to meet deflection requirements. Panels shall be hot dipped galvanized ASTM A 653 Grade C steel panels.

B. Flashing and Trim:
   1. Provide flashings and sheet metal contour closure trim components, indicated or required for a complete installation, as part of the preformed metal roofing panels Work, including cap flashings, base and drip flashings, closure and batten cleats, panel stops and closures, surrounds at openings, soffits, and similar components of the Work.
   2. Provide factory fabricated trim components.
   3. Except as otherwise shown or specified, match the material, gage, and finish of the preformed metal roof panels.
   4. Provide all concealed fasteners for flashing and trim Work.

C. Miscellaneous Materials:
   1. Furring: Light-gage steel, ASTM C 645; 26 gage, hot-dipped galvanized, ASTM A653, G60.
   2. Provide manufacturer's custom, stainless steel, self-tapping concealed fasteners, and hold-down cap assemblies, and other components needed for a complete, permanently weatherproof installation. Provide stainless steel complying with ASTM A 167.

3. All fasteners used at all locations shall be stainless steel.
4. Sealant: Provide manufacturer's standard factory applied elastomeric sealant for use within this Section of the Work, where applicable.

D. Provide strippable film of liquid applied to the top side of the painted coil to protect the finish during fabrication, shipping and field handling. This strippable film must be removed before installation.

E. Products and Manufacturers: Provide products of one of the following:
1. Zip-Rib Standing Seam Metal Roofing, PS-4, B 1515R Panel and Batten, with Flurothane IV Coatings by Merchant and Evans, Incorporated.
2. Standing Seam Panels, Snap-On Batten, with Flurobond Coating by Fabral Metal Roof and Wall Systems, a euromax company.
3. Structural Design Panels, SDP 175, with Duragard Finish by Centria.
4. Or equal.

2.3 PREFORMED PREFINISHED ROOFING PANEL FABRICATION

A. General:
1. Comply with the dimensions, profile limitations, gages and fabrication details as shown or specified.
   a. Width: 16-inches, on centers.
2. Prefabricate all components of the system at the factory, ready for field assembly of preformed prefinished roofing panels, joint cleat, anchor clips, trim and accessories.
3. Fabricate components and assemble units to comply with the performance requirements specified for the completed installation of the Work.

2.4 PREFORMED ROOF PANEL COATINGS

A. High-Performance Organic Finish (Three-Coat Fluoropolymer): AAMA 2605: manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 621 and the coating and resin manufacturers' written instructions.
1. Colors: Provide the following:
   a. Full selection of manufacturer’s standard colors for final selection by ENGINEER.
2. Products and Manufacturers: Provide one of the following:
   a. Kynar 500 Fluropon by the Valspar Corporation.
   b. Kynar 500 Duranar XL by PPG Industries.
   c. Or equal.

2.5 SNOW GUARDS

A. Seam-Mounted, Bar-Type Snow Guards: Aluminum rods or bars held in place by stainless-steel clamps attached to vertical ribs of standing-seam metal roof panels.
   1. Aluminum Finish: Clear anodized.
   2. Stainless-Steel Finish: No. 4.

B. Product and Manufacturers; provide one of the following;
   1. Alpine SnowGuards, Div. of Vermont Slate & Copper Services, Incorporated.
   2. Snow Management Systems, a division of Contek, Incorporated
   3. Or Equal.

2.6 GUTTERS AND DOWNSPOUTS

A. Refer to Section 07 71 00, Roof Specialties.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR and installer must examine the alignment of the substrate framing before erection of the preformed metal roof panels Work begins and notify the ENGINEER, in writing, of unsatisfactory conditions. Do not proceed with the preformed metal roof panels panel Work until unsatisfactory conditions have been corrected in a manner acceptable to the ENGINEER.

3.2 PREPARATION

A. Wherever possible, take field measurements, prior to completion of shop fabrication and finishing of preformed metal roof panels. Do not delay job progress. Allow for trimming where final dimensions cannot be established before fabrication.

3.3 INSTALLATION

A. Comply with preformed metal roof panel manufacturer's instructions for assembly, installation, erection and seaming of preformed metal roofing panel Work.

B. Install light gauge metal framing in accordance with the manufacturer's instructions. Refer to Sections 05 05 33, Anchor Systems.

C. Install insulation. Refer to Section 07 21 05.

D. Anchor component parts of preformed metal roof panels and light gauge metal framing securely in place providing for necessary thermal and structural movement.

E. Do not exceed fastener spacing recommended by the preformed metal roof panel manufacturer.

F. All fasteners must be long enough to penetrate through the entire roof panel assembly and extend through the structural support a minimum of 1/2-inch.

G. Fasten flashings and accessories 12-inches on center.

H. Do not use exposed fasteners on the exterior panel faces.

I. Drive all fasteners normal to the surface and to a uniform depth.

J. Install sealants for the preformed metal roof panels panel Work as specified, and as required for watertight performance. Comply with sealant manufacturer's instructions for installation and curing.

K. Do not fabricate flashings, closures and associated trim at the Site.

L. Install all special flashing and trim shapes, and calking compounds required to maintain complete weathertightness.

M. Comply with roofing panel manufacturer's instructions and recommendations.

N. Install snow guards in accordance with manufacturer's instructions and recommendations for type of metal roof installation.

3.4 FIELD QUALITY CONTROL

A. Determine conformity of preformed prefinished metal finish to this Section as follows:
   1. The manufacturer of the preformed, metal roof panels shall set aside a labeled sample of the preformed, metal roof panels from each production lot of panels at the Site. Protect sample preformed metal roof panels from weather.
   2. Make sample preformed metal roof panels available at all times, for comparison with installed preformed metal roof panels, as requested by the OWNER, for the full time period of the warranty.
   3. Make color comparison measurements with a Hunter Tristimulus Color Difference Meter employing methods of computation in use at the National Bureau of Standards conforming to ASTM D 2244.
   4. Manufacturer's technical representative shall visit the Site to perform field inspection of the roof panels, flashing and other system components at the start and at Substantial Completion of Work prior to issuance of warranty, as a minimum, and as otherwise requested by the ENGINEER. Each inspection visit shall include a written review of the entire installation to date, signed by the manufacturer's technical representative and submitted to the ENGINEER. CONTRACTOR shall notify the ENGINEER a minimum of two working days prior to the Site visit by the manufacturer's technical representative.

3.5 ADJUSTMENT AND CLEANING

A. Set preformed, metal roof panels plumb, level, and true to line, without warp or rack.

B. Clean exposed surfaces of preformed metal roof panel Work promptly after completion of installation. Comply with recommendations of the preformed, metal roof panel manufacturer.

C. Leave preformed metal roof panels and flashing perfectly flat, free from dents, burrs, scratches, holes or other blemishes.

D. Do not erect components which have become scarred, chipped or otherwise damaged or defaced.

E. Remove and replace with new material preformed, metal roof panels and component parts of the Work, including finish, which have been damaged beyond successful repair, as directed by the ENGINEER, in writing. Repair minor damage.

F. Do not use roofing panel sheets, trim members, and flashing sheets, in which holes have been made in locations where fasteners are not required.

G. At the completion of the Work, clean or replace adjacent work, marred by the Work of this Section.

H. Remove all materials and debris and leave the Site of the Work in clean condition.

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SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install sheet metal flashing and trim.
   2. The Work also includes:
      a. Providing openings in sheet metal flashing and trim to accommodate the Work under this and other Sections and building into the sheet metal flashing and trim all items such as sleeves, anchor bolts, inserts and all other items to be embedded in sheet metal flashing and trim for which placement is not specifically provided under other Sections.
   3. Extent of the sheet metal flashing and trim is shown.
   4. Types of products required include the following:
      a. Stainless steel sheet flashing.
      b. Miscellaneous flashing not supplied under other Sections.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with the sheet metal flashing and trim Work.
   2. Work advanced without sheet metal flashing and trim items that are specified to be cast-in-place or built-in-place as the Work advances, shall be stopped, demolished and rebuilt incorporating specified sheet metal flashing and trim Work, at no additional cost to OWNER.

C. Related Sections:
   1. Section 04 00 05, Masonry.
   2. Section 05 50 13, Miscellaneous Metal Fabrications.
   3. Section 07 41 13, Metal Roof Panels.
   4. Section 07 92 00, Joint Sealants.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. ASTM A 666, Specification for Annealed or Cold-Worked Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar.
   2. ASTM B 29, Specification for Refined Lead.
   3. ASTM B 32, Specification for Solder Metal.
   4. ASTM B 749, Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.

5. ASTM D 4586, Specification for Asphalt Roof Cement, Asbestos-Free.
6. FM Global, Loss Prevention Data for Roofing Contractors, 1-49 - Perimeter Flashing.
7. NRCA, Low-Slope Membrane Roofing Construction Details Manual.
8. SMACNA 1013, Architectural Sheet Metal Manual.
9. SSPC - Paint 12, Cold Applied Asphalt Mastic (Extra Thick Film).

1.3 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Engage a single installer who is a recognized flashing and trim installer, skilled and experienced in the type of flashing and trim Work required, and equipped to perform workmanship in accordance with recognized standards so that there will be undivided responsibility for the performance of the Work. Submit name and qualifications to ENGINEER along with at least three successfully completed Projects including names and telephone numbers of owners, architects and engineers, responsible for the project and the approximate contract price for flashing and trim work.
   2. The installer of the sheet metal flashing and trim Work shall be franchised or otherwise accepted in writing by the roofing materials manufacturer for installation of fully guaranteed roofing Work in accordance with these Specifications. Refer to Section 07 41 13, Metal Roof Panels for roof warranty details.

B. Source Quality Control:
   1. Except as otherwise shown, comply with recommendations of the roofing manufacturer concerning the installation of flashing and trim that affects the roofing bond or warranty.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings showing the manner of forming, jointing and securing flashings and trim. Show fully dimensioned joint details and waterproof connections to adjoining Work and details at obstructions and penetrations.
   2. Drawings showing the coordination of the Work of this Section with Section 04 00 05, Masonry, and Section 07 41 13, Metal Roof Panels. Provide detailed Shop Drawings showing large scale details of sections and profiles of all sheet metal flashing and trim to be used in the Work, with all items, including fastener locations, cleats and other miscellaneous accessories necessary to complete the Work, fully dimensioned, properly located, quantified and presented such that sequence of installation is acceptable to each roofing system and adjacent construction material installer.
   3. Samples:
      a. 12-inch square samples of specified sheet metal flashing and trim metals.

4. Product Data:
    a. Copies of manufacturer's specifications, installation instructions and general recommendations for sheet metal flashing and trim required. Include manufacturer's data substantiating that the materials comply with the requirements.

B. Informational Submittals: Submit the following:
    1. Qualifications Statements:
        a. Installer’s qualifications

C. Closeout Submittals: Submit the following:
    1. Warranty
        a. Submit warranty as specified in Article 1.7

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:
    1. Deliver sheet metal flashing and trim materials in manufacturer's original, unopened, and undamaged containers and rolls, with labels intact and legible, indicating compliance with approved Shop Drawings.
    2. Items delivered in broken, damaged, rusted, or unlabeled condition shall immediately be removed from Site and not offered again for approval by ENGINEER.

B. Storage of Materials:
    1. Store materials in an area undercover and protected from construction traffic.
    2. Store materials in same package in which they were shipped, off the ground and on platforms protected from dirt and other contamination.
    3. Store in a manner which does not permit water to remain on sheet metal flashing and trim materials and system components.

C. Handling of Materials:
    1. Protect sheet metal flashing and trim from dents, scratches, warps and bends.
    2. Remove strippable protective film, immediately preceding installation of each system component.

1.6 JOB CONDITIONS

A. Scheduling:
    1. Do not proceed with sheet metal flashing and trim Work until curb and substrate construction, cant strips, blocking, reglets and other construction to receive the Work is completed.
    2. Deliver materials to the Site in sufficient quantities to ensure uninterrupted progress of the Work.
    3. Schedule the installation of sheet metal flashing and trim to coincide with the installation of masonry, roofing, waterproofing, drains, piping, blocking, nailers, reglets, framing at openings, curbs, and other adjoining and substrate Work.

4. Proceed with and complete the Work only when materials, equipment and knowledgeable tradesmen, required for the installation of sheet metal flashing and trim, are at the Site and are ready to follow, and integrate sheet metal flashing and trim Work with roofing Work, in order to maintain watertight conditions.

1.7 WARRANTY

A. Provide reglet and counterflashing manufacturer's five-year warranty against defects and workmanship.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Performance Criteria:
   1. Sheet metal flashing and trim shall be permanently watertight, and not deteriorate in excess of manufacturer's published limitations.
   2. Comply with fabrication details recommended by FM, SMACNA, NRCA and the requirements of the sheet metal flashing and trim manufacturer, and as shown on approved Shop Drawings.

2.2 MATERIALS

A. Sheet Metal Flashing and Trim:
   1. Stainless Steel Sheet metal flashing and trim: Provide 26 gage sheet stainless steel, Type 316, complying with ASTM A 666, with No. 2D dead soft, fully annealed finish, unless required to be harder temper for proper forming and performance for application indicated.

B. Embedded Sheet Flashing:
   1. Refer to Section 04 00 05, Masonry.

C. Miscellaneous Materials:
   1. Solder for Stainless Steel: ASTM B 32, 60 percent tin and 40 percent lead alloy grade 60A, used with an acid flux of the type recommended by the stainless steel manufacturer. Use a non-corrosive rosin flux over tinned surfaces.
   2. Stainless Welding Rods: Type recommended by stainless steel sheet manufacturer for the type of metal sheets furnished.
   3. Nails, Screws and Rivets: Same material as flashing sheet, or as recommended by manufacturer of flashing sheet.
   4. Cleats: Same metal and gage as sheet being anchored, 2-inches wide, punched for two anchors.
   5. Bituminous Coating: SSPC-Paint 12, cold-applied solvent-type bituminous mastic coating for application in dry film thickness of 15-mils per coat.
   6. Sealants: Refer to Section 07 92 00, Joint Sealants.

7. Miscellaneous steel plate for scuppers, escutcheon, and bearing plates: Section 05 50 13, Miscellaneous Metal Fabrications.

2.3 FABRICATION

A. Fabricated Metal Flashing: Shop-fabricate metal sheet metal flashing and trim to comply with profiles and sizes shown, and to comply with manufacturer's recommended details. Except as otherwise shown or specified, provide soldered flat-lock seams, and fold back metal to form a hem on the concealed side of exposed edges. Comply with metal producers' recommendations for tinning, soldering, and cleaning flux from metal.

B. Where fabricator does not recommend grinding welds smooth, comply with SMACNA formed metal details requiring double-lock seamed construction.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR and installer shall examine the substrate and the conditions under which the sheet metal flashing and trim Work is to be performed, and notify ENGINEER, in writing, of unsatisfactory conditions. Do not proceed with sheet metal flashing and trim Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 PREPARATION

A. Before installing sheet metal flashing and trim, verify shapes, and dimensions to be covered.

B. Prepare substrates as recommended by the sheet metal manufacturer.

3.3 INSTALLATION

A. General:
   1. Separate dissimilar metals from each other by painting each metal surface in the area of contact with a heavy application of bituminous coating, or by other permanent separation as recommended by the manufacturers of the dissimilar metals. Comply with the following:
      a. Separate stainless steel from dissimilar metals, including regular steel and iron, and from cementitious materials by a course of roofing felt wherever possible. Where felt application is not possible, coat the stainless steel or the other material with a 15-mil bituminous coating. Where felt is applied under sheets which will be soldered or welded, cover felt with a course of building paper before installing stainless steel. Comply with manufacturer's recommendations for other forms of protection of the stainless steel against corrosion.

2. Provide thermal expansion for running trim, flashing, valleys, and other items exposed for more than 15 feet-0 inches continuous length. Maintain a watertight installation at expansion seams. Locate expansion seams as shown or, if not shown, at the following maximum spacing for each general flashing use:
    a. Valleys: Midway between drains (at high points in slopes), but in no case more than 30 feet-0 inches apart, except as otherwise shown.
    b. Sheet metal flashing and trim: At 10 feet-0 inch intervals and 2 feet-0 inch each side of corners and intersections.
3. Fabricate and install Work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves and avoidable tool marks, considering the temper and reflectivity of the metal. Provide uniform, neat flat-locked seams with minimum exposure of solder, welds and sealant. Except as otherwise shown, fold back the sheet metal to form a hem on the concealed side of exposed edges. All exposed edges of all sheet metal flashing shall be hemmed not less than 1/2-inch wide.
4. Conceal fasteners and expansion provisions wherever possible in exposed Work, and locate so as to minimize the possibility of leakage. Cover and seal Work as required for a watertight installation.
    a. Provide cleat-type anchorages for metal flashings and trim wherever practical, arranged to relieve stresses from building movement, and thermal expansion and contraction.
5. On vertical surfaces lap two-piece flashings a minimum of 4-inches.
6. On sloping surfaces, for slopes of not less than 6-inches in 12-inches, lap unsealed flashings a minimum of 6-inches. For slopes less than 6-inches in 12-inches use soldered flat locked seams.
7. For embedment of metal flashing flanges in roofing or composition flashing or stripping, extend flanges for a minimum of 4-inches embedment.

B. Installation of Stainless-Steel Sheet Metal Flashing and Trim:
1. Tin the edges of plain stainless steel to be soldered, for a width of 1-1/2-inches, using solder for stainless steel and acid flux. Remove every trace of acid flux residue from the metal promptly after tinning or soldering.
2. Where welded joints are shown, provide upturned, 1/2-inch wide hooked flanges, and weld between adjoining sheets; lay seam flat.

C. Installation of Elastic Sheet Metal Flashing and Trim:
1. Refer to Section 04 00 05, Masonry.

3.4 ADJUSTMENT AND CLEANING

A. Protect sheet metal flashing and trim until Final Acceptance of the Work.

B. Do not permit workmen, or others, to step directly on flashing sheets in place, or to place or move equipment over sheet metal flashing and trim surfaces. Protect surfaces during installation of permanent covering work and adjoining Work.

C. Neutralize excess flux as the Work progresses with five percent to percent washing soda solution and rinse thoroughly.

D. Clean exposed surfaces of every substance which is visible or might cause corrosion or prevent uniform oxidation of the metal surfaces. Exercise extreme care to remove fluxes and ferrous metal particles, including welding splatter and grinding dust.

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SECTION 07 71 00

ROOF SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all roof specialties Work.
   2. The extent of the roof specialties is shown.
   3. The types of roof specialties Work required include, but is not necessarily limited to, the following:
      a. Exposed, surface-mounted custom gutters and downspouts.
      b. Welded miters, end caps, downspout elbows and downspouts.
      c. Complete selection of full-strength, polyvinylidene fluoride finishes and colors with extended life topcoat.
      d. Miscellaneous accessories, fasteners, cleats and incidental sheet metal flashing and trim system components necessary for a complete installation.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that shall be installed with the roof specialties Work.

C. Related Sections:
   1. Section 04 00 05, Masonry.
   2. Section 05 50 13, Miscellaneous Metal Fabrications.
   3. Section 07 41 13, Metal Roof Panels.
   4. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. AAMA 621, Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates.
   2. FM Global, Loss Prevention Data for Roofing Contractors, 1-49 - Perimeter Flashing.
   3. FS H-C-494, Coating Compound, Bituminous, Solvent Type, Acid Resistant.
   4. FS TT-C-494, Federal Specification, Coating Compound, Bituminous, Solvent Type, Acid Resistant.
   5. NRCA, The Roofing Manual.
   6. SMACNA: Architectural Sheet Metal Manual.

1.3 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Engage a single installer who is a recognized roof specialties installer, skilled and experienced in the type of roof specialties Work required, and equipped to perform workmanship in accordance with recognized standards so that there will be undivided responsibility for the performance of the Work. Submit name and qualifications to ENGINEER along with at least three successfully completed Projects including names and telephone numbers of owners, architects and engineers, responsible for the project and the approximate contract price for roof specialties work.
   2. The installer of the roof specialties Work shall be franchised or otherwise accepted in writing by the roofing materials manufacturer for installation of fully guaranteed roofing Work in accordance with these Specifications.

B. Design Criteria:
   1. Standards: Comply with applicable standards and recommendations of SMACNA, Architectural Sheet Metal Manual, for the fabrication and installation of roof specialties Work, except to the extent more stringent requirements are specified.

C. Component Supply and Compatibility: Provide roof specialties as a complete unit produced by a single manufacturer specializing in the production of this type of Work, including hardware, accessories, mounting and installation components.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Shop Drawings showing the manner of forming, jointing and securing the metal to form roof specialties Work. Show expansion joint details and water-proof connections to adjoining work and at obstructions and penetrations.
      b. Drawings showing the coordination of the Work of this Section with Section 04 00 05, Masonry, and Section 07 41 13, Metal Roof Panels. Provide detailed Shop Drawings showing large scale details of sections and profiles of all roof specialties to be used in the Work, with all items, including fastener locations, cleats and other miscellaneous accessories necessary to complete the Work, fully dimensioned, properly located, quantified and presented such that sequence of installation is acceptable to each roofing system and adjacent construction material installer.
   2. Product Data:
      a. Copies of manufacturer's specifications, recommendations and installation instructions for roof specialties applications. Include manufacturer's certification or other data substantiating that the materials comply with the requirements.
   3. Samples:

a. Each item of roof specialty, demonstrating assembly of system joint components and fasteners, securely mounted to substrate simulating actual installation in the Work.
b. Polyvinylidene fluoride manufacturer's color samples for final selection by ENGINEER. After initial selection of colors by ENGINEER from manufacturer's color charts, submit ENGINEER'S preliminary color choices on actual samples of metal substrate for final color selections by ENGINEER.
c. Samples will be reviewed by ENGINEER for color and texture only. Compliance with other requirements is the responsibility of CONTRACTOR.

B. Informational Submittals: Submit the following:
1. Qualifications Statements:
a. Installer's qualifications

C. Closeout Submittals: Submit the following:
1. Warranty
a. Submit warranty as specified in section 1.7

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:
1. Deliver, store and handle materials to preclude denting, scratching or otherwise marring the surface and finish of the roof specialties material.
2. Items delivered in broken, damaged, rusted, or unlabeled condition shall immediately be removed from Site and not offered again for approval by ENGINEER.

B. Storage of Materials:
1. Store materials in an area undercover and protected from construction traffic.
2. Store materials in same package in which they were shipped, off the ground and on platforms protected from dirt and other contamination.
3. Store in a manner which does not permit water to remain on roof specialties materials and system components.

C. Handling of Materials:
1. Protect roof specialties from dents, scratches, warps and bends.
2. Remove strippable protective film, immediately preceding installation of each system component.

1.6 JOB CONDITIONS

A. Scheduling:
1. Coordinate roof specialties Work with roofing, flashing, trim, and the construction of decks, parapets and other adjoining work, to provide a permanently watertight, leak-proof, secure and non-corrosive installation.

2. Deliver materials to the Site in sufficient quantities to ensure uninterrupted progress of the Work.
3. Schedule the installation of roof specialties to coincide with the installation of roofing, waterproofing, drains, piping, blocking, nailers, reglets, framing at openings, curbs, parapets and other adjoining and substrate Work.
4. Proceed with and complete the Work only when materials, equipment, and knowledgeable tradesmen, required for the installation of roof specialties, are at the Site and are ready to follow, and integrate roof specialties Work with roofing Work, in order to maintain watertight conditions.

1.7 WARRANTY

A. Provide manufacturer's twenty-year warranty on the specified polyvinylidene fluoride-based coating.

B. Guarantee that the polyvinylidene fluoride-based coating meets all criteria specified and will not spall, check, craze, peel or otherwise lose adhesion for a period of twenty years from the date of installation, to the extent that such shall create unsightly conditions or otherwise impair the intended architectural qualities of the building.

C. In the event that the polyvinylidene fluoride-based coating fails to meet the specified standards the manufacturer shall, at their own expense, replace or field paint, at the discretion of OWNER, all areas affected by the failure. In the event that repainting is selected, it shall be done at mutually agreeable intervals throughout the term of the warranty.

D. The warranty specified 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.

E. The warranty does not apply where failure is caused by accidents, or external conditions or forces beyond the control of the manufacturer.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Performance Criteria:
1. Roof specialties shall be permanently watertight, and not deteriorate in excess of manufacturer's published limitations.
2. Comply with fabrication details recommended by FM Global, Loss Prevention Data for Roofing Contractors; SMACNA, Architectural Sheet Metal Manual; The NRCA Roofing Manual, and the requirements of the roof specialties manufacturer, and as shown on approved Shop Drawings.

2.2 MATERIALS

A. Custom Gutters, and Downspouts:
   1. Provide aluminum sheet 6063-T6 alloy, with smooth finish; in accordance with SMACNA.
   2. Size, Thickness, and Profile:
      a. Gutters and Downspouts: 1/8-inch thick; As shown.
   3. Products and Manufacturers: Provide one of the following:
      a. Custom Gutters and Downspouts by Architectural Products Company.
      b. Custom Seal-Tite Gutters and Industrial Downspouts by Metal-Era Incorporated.
      c. Or equal.
   4. Miscellaneous Materials:
      a. Provide the materials and types of fasteners, solder, welding rods, coatings, separators, aluminum wall penetration, sealants, and accessory items as recommended by the sheet metal manufacturer for roof specialties Work, except as otherwise shown.
      b. Cleats and Straps: Same metal as roof specialties Work being anchored or supported.
      c. Roofing Cement: Neoprene adhesive, compatible with substrate and adjoining work.
      d. Bituminous Coating: Cold-applied asphaltic coating, FS TT-C-494, Type II, compounded for minimum thickness per coat of 15-mils (dry).
      e. Miscellaneous steel escutcheons, and bearing plates: Refer to Section 05 50 13, Miscellaneous Metal Fabrications.

2.3 FABRICATION

A. General:
   1. The fabrication requirements for roof specialty Work apply to both shop-fabricated and on-site-fabricated Work.
   2. Manufacturer's Recommendations: Except as otherwise shown or specified, comply with the recommendations and instructions of the manufacturer of the roof specialty being fabricated.
   3. Provide for thermal expansion of exposed items. Maintain a water-tight seal at expansion joints. Locate expansion joints at the following maximum spacings:
      a. Midpoint of run.
   4. Fabricate Work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks, considering the temper and reflectivity of the metal. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant. Fold back the sheet metal to form a hem on the concealed side of exposed edges.
   5. Fabricate drainage sumps and downspouts and supports as shown.
   6. Support and Anchorage: Fabricate units with adequate provisions for support and anchorage, of the types required for the indicated method of installation.

B. Aluminum Drainage Sump and Downspouts: Fabricate aluminum sheet using double flat-lock seams. Rivet joints where necessary for strength. Pop rivets are not acceptable.

2.4 FINISHES

A. High-Performance Organic Finish (Three-Coat Fluoropolymer): AAMA 2605: manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 621 and the coating and resin manufacturers' written instructions.
   1. Colors: Provide the following:
      a. Full selection of manufacturer's standard colors for final selection by ENGINEER.
2. Products and Manufacturers: Provide one of the following:
   a. Kynar 500 Fluropon by the Valspar Corporation.
   b. Kynar 500 Duranar XL by PPG Industries.
   c. Or equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR and installer shall examine the supporting structure and other elements of the substrate and conditions under which the roof specialties Work is to be performed and notify ENGINEER, in writing, of any conditions detrimental to the proper and timely completion of the Work and performance of the drainage sumps, roof and overflow drains, and downspouts. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 PREPARATION

A. Wherever possible, take field measurements, prior to completion of shop fabrication and finishing of roof specialties Work. Do not delay job progress. Allow for erection tolerances corresponding with specified tolerances where final dimensions cannot be established before fabrication.

B. Coordinate the installation of the roof specialty system with the roofing system. Refer to Section 07 41 13, Metal Roof Panels for details.

3.3 INSTALLATION

A. Comply with manufacturer's recommendations and installation instructions.

B. Protection of Aluminum from Dissimilar Materials: Coat all aluminum surfaces in contact with dissimilar materials such as concrete, masonry, steel and other metals as specified in Section 09 91 00, Painting.

C. Conceal fasteners and expansion provisions, wherever possible, in exposed Work, and locate so as to minimize the possibility of leakage. Cover and seal Work, as required, for a tight installation.

D. Provide concealed cleat-type anchorages wherever practical and arrange to relieve stresses in the roof specialties Work which result from building movement and thermal expansion.

E. Splice and Expansion Units: Use 0.050-inch thick splice plates.

F. Bed flashing flanges in a bed of roofing cement or other setting compound which is compatible with adjoining work and substrate.

G. On vertical overlaps, lap sheet metal a minimum of 3-inches.

H. On sloping overlaps, of slopes of not less than 6-inches in 12-inches, lap unsealed overlaps a minimum of 6-inches.

I. For embedment of metal flanges in elastic sheet flashing or stripping, extend flanges for a minimum of 4-inches embedment.

J. Support and anchor each unit of Work in the manner as shown, but in no case in a manner which would be inadequate for thermal expansion stresses and the normal loading of water, wind and similar loadings.

K. Install units with lines and corners true and accurate in alignment and location. Install drainage sumps to assure positive drainage to downspouts.

3.4 FIELD QUALITY CONTROL

A. Polyvinylidene Fluoride Based Coatings: Determine conformity of sheet metal flashing and trim Work requiring painted finish to these Specifications as follows:
   1. The manufacturer of the roofing specialties Work shall set aside and label samples of each component of the sheet metal flashing and trim Work from each production lot for the Project. Protect samples from weather.
   2. Make samples of sheet metal flashing and trim Work available at all times, for comparison with installed sheet metal flashing and trim Work as requested by OWNER, for the full time of the warranty.
   3. Make color comparison measurements with a Hunter Tristimulus Color Difference Meter employing methods of computation in use at the National Bureau of Standards.

3.5 CLEANING AND PROTECTION

A. Protect the roof specialties from all damage until Final Completion.

B. Roof specialties damaged before Final Completion shall be replaced with new material as specified herein, at no additional cost to OWNER.

C. Clean exposed surfaces of every substance which is visible or might cause corrosion of the metal or deterioration of the finish.

+ + END OF SECTION + +

SECTION 07 92 00

JOINT SEALANTS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install joint sealants.
   2. Extent of each type of calking and sealant is shown or indicated and includes the following:
      a. Interior and exterior joints in equipment and construction systems not filled by another material, and that are not required to be open for operation.
      b. Joints specified to be re-calked.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate installation of items to be installed with or before joint sealants.
   2. Coordinate final selection of joint sealants so that materials are compatible with all calking and sealant substrates specified.

C. Related Sections:
   1. Section 03 15 00, Concrete Accessories.
   2 Section 04 00 05, Masonry.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM C510, Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
   2. ASTM C661, Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
   3. ASTM C793, Test Method for Effects of Accelerated Weathering on Elastomeric Joint Sealants.
   4. ASTM C794, Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
   5. ASTM C920, Specification for Elastomeric Joint Sealants.
   6. ASTM C1021, Practice for Laboratories Engaged in Testing Building Sealants.
   7. ASTM C1087, Test method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
   8. ASTM C1193, Guide for Use of Joint Sealants.

9. ASTM C1247, Practice for Durability of Sealants Exposed to Continuous Immersion in Liquids.
10. BAAQMD Regulation 8, Rule 51.
11. FS TT-S-00227, Sealing Compound: Elastomeric Type, Multi-component (for Calking, Sealing, and Glazing in Buildings and Other Structures).
12. FS TT-S-00230 Sealing Compound: Elastomeric Type, Single Component (for Calking, Sealing, and Glazing in Buildings and Other Structures).
13. NSF/ANSI Standard 61, Drinking Water System Components - Health Effects.
14. SCAQMD Rule 1168.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Installer:
      a. Engage a single installer, approved by product manufacturer, regularly engaged in calking and sealant installation and with successful experience in applying types of products required, and who employs only tradesmen with specific skill and successful experience in the type of Work required.
   2. Testing Laboratory:
      a. Furnish services of independent testing laboratory qualified according to ASTM C1021, for conducting testing required.

B. Component Supply and Compatibility:
   1. Obtain materials only from manufacturers who will, if required:
      a. Furnish at the Site services of a qualified technical representative to advise installer of proper procedures and precautions for using materials.
      b. Test joint sealants for compatibility with substrates for conformance with FS-TT-S-00227, and recommend remedial procedures as required.
   2. Before purchasing each sealant, investigate its compatibility with joint surfaces, joint fillers, and other materials in joint system. Provide products that are fully compatible with actual installation condition, verified by manufacturer's published data or certification, and as shown on approved Shop Drawings and other approved submittals.

C. Product Testing: Provide test results of laboratory pre-construction compatibility and adhesion testing, as specified in Article 3.1 of this Section, by qualified testing laboratory, based on testing of current sealant formulations within a 36-month period preceding the Notice to Proceed for the Work.
   1. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920 and, where applicable, to other standard test methods.
   2. Test other joint sealants for compliance using specified post-construction field adhesion test.

D. Mock-ups:
   1. Prior to installing joint sealant Work but after ENGINEER's approval of Samples, provide Sample of each type of calking and sealant in areas selected by ENGINEER to show representative installation of calkings and sealants. Obtain ENGINEER's approval of visual qualities of mock-ups before starting calking and sealant Work. Retain and protect mock-ups during construction as a standard for judging completed calking and sealant Work. Do not alter or destroy mock-ups until so allowed by ENGINEER.
   2. Perform the following testing on calking and sealant mock-up, as specified in this Section: Post-construction field adhesion testing and water leak test.
   3. Work that does not comply with test requirements on Sample areas will be considered defective.

E. Pre-installation Conference:
   1. Prior to installing joint sealants and associated Work, schedule and meet at the Site with calking and sealant installer, calking and sealant manufacturer's technical representative, other trades involved in coordinating with calking and sealant Work, ENGINEER, and OWNER. Record discussions of pre-installation conference and decisions, agreements, and disagreements, and furnish copy of record to each party attending conference. Review foreseeable methods and procedures related to calking and sealant Work, including reviewing:
      a. Required submittals, both completed and yet to be completed.
      b. Status of test reports.
      c. Mock-up construction results.
      d. Status of substrate and similar considerations.
      e. Each major calking and sealant application required.
      f. Availability of products, tradesmen, equipment, and facilities required for avoiding delays.
   2. Reconvene conference at earliest opportunity if additional information must be developed to conclude subjects under consideration.
   3. Record revisions or changes agreed upon, reasons therefore, and parties agreeing or disagreeing with them.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Schedule of joint sealants installation, indication each specific surface where calking or sealants are to be provided and the material proposed for each application.
   2. Product Data:
      a. Copies of manufacturer's data sheets including color charts, specifications, recommendations, and installation instructions for each type of sealant, calking compound, and associated miscellaneous material required. Include manufacturer's published data, indicating that each product complies with the Contract Documents and is intended for the applications shown or indicated.

b. Product test reports.

3. Samples:
   a. Each type of actual cured material of each calking and sealant specified, in each of manufacturer's standard colors.
   b. Samples will be reviewed by ENGINEER for color and texture only. Compliance with other requirements is responsibility of CONTRACTOR.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Certify that materials are suitable for intended use and materials meet or exceed requirements of the Contract Documents.
      b. Certification from manufacturer that products furnished are appropriate for surfaces and conditions to which they will be applied.
      c. Certify that applicator is approved by manufacturer.
   2. Field Quality Control Submittals:
      a. Results of tests on job mock-ups.
      b. Pre-construction and post-construction field test reports.
      c. Compatibility and adhesion test reports.
      d. Contractor's Field Test Report Logs:
         1) Indicate time present at the Site.
         2) Include observations and results of field tests, and document compliance with manufacturer's installation instructions and supplemental instructions provided to installers.
   3. Pre-installation conference record.
   4. Qualifications: Submit qualifications for:
      a. Installer.
      b. Testing laboratory (if not already submitted under Section 01 45 23, Testing Laboratory Services Furnished by Owner, or Section 01 45 13, Testing Laboratory Services Furnished by Contractor).

C. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Data:
      a. Recommended inspection intervals.
      b. Instructions for repairing and replacing failed sealant joints.
   2. Warranty: Submit written warranties as specified in this Section.

1.5 DELIVERY, STORAGE AND HANDLING

A. Comply with Section 01 65 00, Product Delivery Requirements, and Section 01 66 00, Product Storage and Handling Requirements, and the following:
   1. Delivery of Products:
      a. Deliver products in calking and sealant manufacturer's original unopened, undamaged containers, indicating compliance with approved Shop Drawings and approved Sample color selections.
      b. Include the following information on label:
         1) Name of material and Supplier.

2) Formula or Specification Section number, lot number, color and date of manufacture.
3) Mixing instructions, shelf life, and curing time, when applicable.

2. Storage of Products:
   a. Do not store or expose materials to temperature above 90 degrees F or store in direct sunlight.
   b. Do not use materials that are outdated as indicated by shelf life.
   c. Store sealant tape in manner that will not deform tape.
   d. In cool or cold weather, store containers for sixteen hours before using in temperature of approximately 75 degrees F.
   e. When high temperatures prevail, store mixed sealants in a cool place.
3. Handling:
   a. Do not open containers or mix components until necessary preparatory Work and priming are complete.

1.6 JOB CONDITIONS

A. Environmental Conditions:
   1. Do not install joint sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.
   2. Proceed with the Work when forecasted weather conditions are favorable for proper cure and development of high-early bond strength.
   3. Where joint width is affected by ambient temperature variations, install elastomeric sealants when temperatures are in the lower third of manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures.
   4. When high temperatures prevail, avoid mixing sealants in direct sunlight.
   5. Supplemental heat sources required to maintain both ambient and surface temperatures within the range recommended by manufacturer for material applications are not available at the Site.
   6. Provide supplemental heat and energy sources, power, equipment, and operating, maintenance, and temperature monitoring personnel.
   7. Do not use heat sources that emit carbon dioxide or carbon monoxide into areas of calking, sealants, and painting Work, and areas where OWNER's personnel or construction personnel may work. Properly locate and vent such heat sources to outdoors so that joint sealants and other Work are unaffected by exhaust.

1.7 WARRANTY

A. Provide written warranty, signed by manufacturer and CONTRACTOR, agreeing to repair or replace sealants that fail to perform as air-tight and watertight joints; or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability; or appear to deteriorate in any other manner not clearly specified in approved Shop Drawings and other submittals, as an inherent quality of material for exposure indicated.

1. Provide manufacturer warranty for period of one year from date of Substantial Completion of joint sealants Work.
2. Provide installer warranty for period of two years from date of Substantial Completion of joint sealants Work.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Provide elastomeric joint sealants for interior and exterior joint applications that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. VOC Performance Criteria:
   1. VOC content of sealants used shall comply with current VOC content limits of SCAQMD Rule 1168. Sealants used as fillers shall comply with or exceed requirements of BAAQMD Regulation 8, Rule 51.
      a. Sealants: 250 g/L.
      b. Sealant Primers for Nonporous Substrates: 250 g/L.
      c. Sealant Primers for Porous Substrates: 775 g/L.

C. Provide colors selected by ENGINEER from calking and sealant manufacturer's standard and custom color charts. "Or equal" manufacturers shall provide same generic products and colors as available from manufacturers specified.

2.2 MATERIALS

A. Exterior and Interior Vertical Joints; Non-submerged:
   1. Two-component Polyurethane Sealant:
      a. Products and Manufacturers: Provide one of the following:
         1) Sikaflex- 2c NS by Sika Corporation.
         2) Dymeric 240 FC by Tremco Sealant/Waterproofing Division of RPM International, Inc.
         3) Or equal.
      b. Polyurethane based, two-component elastomeric sealant complying with:
         1) FS TT-S-00227E: Type II (non-sag) Class A and ASTM C920, Type M, Grade NS, Class 25.
         2) Adhesion-in-Peel, FS TT-S-00227E and ASTM C794: (Minimum five pounds per linear inch with no adhesion failure): 10 pounds.
         3) Hardness (Standard Conditions), ASTM C661: 25 to 35 (Shore A).
         4) Stain and color change, FS TT-S-00227E and ASTM C510: No discoloration or stain.
         5) Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.
         6) Rheological Vertical Displacement at 120 degrees F, FS TT-S-00227E: No sag.

7) VOC Content: 100 g/L, maximum.

B. Exterior and Interior Horizontal Joints; Non-submerged:
   1. Two-component Polyurethane Sealant:
      a. Products and Manufacturers: Provide one of the following:
         1) Sikaflex- 2c SL by Sika Corporation.
         2) THC/900 by Tremco Sealant/Waterproofing Division of RPM International, Inc.
         3) Or equal.
      b. Polyurethane based, two-component elastomeric, self-leveling sealant complying with the following:
         1) FS TT-S-00227E, Type I (self-leveling) Class A. and ASTM C920, Type M, Grade P, Class 25
         2) Water Immersion Bond, FS TT-S-00227E: Elongation of 50 percent with no adhesive failure.
         3) Hardness (Standard Conditions), ASTM C661: 35 to 45.
         4) Stain and Color Change, FS TT-S-00227E and ASTM C510: No discoloration or stain.
         5) Accelerated Aging, ASTM C793: No change in sealant characteristics after 250 hours in weatherometer.
         6) VOC Content: 165 g/L, maximum.

C. Miscellaneous Materials:
   1. Joint Cleaner: As recommended by calking and sealant manufacturer.
   2. Joint Primer and Sealer: As recommended for compatibility with calking and sealant by calking and sealant manufacturer.
   3. Bond Breaker Type: Polyethylene tape or other plastic tape as recommended for compatibility with calking and sealant by calking and sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of calking and sealant. Provide self-adhesive tape where applicable.
   4. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable nonabsorptive material as recommended for compatibility with calking and sealant by calking and sealant manufacturer. Provide size and shape of rod that will control joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide highly-compressible backer to minimize possibility of sealant extrusion when joint is compressed.
   5. Low-temperature Catalyst: As recommended by calking and sealant manufacturer.

D. Products for Other Applications:
   1. Compressible Filler: Refer to Section 04 00 05, Masonry.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine joint surfaces, substrates, backing, and anchorage of units forming sealant rabbet, and conditions under which calking and sealant Work will be performed, and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work and performance of sealants. Do not proceed with calking and sealant Work until unsatisfactory conditions are corrected.

B. Laboratory Pre-construction Compatibility and Adhesion Testing: Submit to joint sealant manufacturers for testing indicated below samples of materials that will contact or affect joint sealants.
   1. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Submit at least eight pieces of each type of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For products that fail tests, obtain joint-sealant manufacturer's written instructions for corrective measures including using specially formulated primers.
   5. Immersion Testing: ASTM C1247 for potable water and wastewater.
   6. Testing will not be required if joint sealant manufacturers submit joint preparation data based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted and mock-up field testing is acceptable.

3.2 PREPARATION

A. Protection: Do not allow joint sealants to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces including rough textured materials. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either the primer/sealer or calking and sealant materials.

B. Joint Surface Preparation:
   1. Clean joint surfaces immediately before installing sealant compound. Remove dirt, weakly adhering coatings, moisture and other substances that would interfere with bonds of sealant compound as recommended in sealant manufacturer's written instructions as shown on approved Shop Drawings.
   2. If necessary, clean porous materials by grinding, sandblasting, or mechanical abrading. Blow out joints with oil-free compressed air or by vacuuming joints prior to applying primer or sealant.
   3. Roughen joint surfaces on vitreous coated and similar non-porous materials, when sealant manufacturer's data indicates lower bond strength than for

porous surfaces. Rub with fine abrasive cloth or steel wool to produce a dull sheen.

4. Concrete Joint Preparation: Refer to Section 03 15 00, Concrete Accessories

C. Mixing:
   1. Comply with sealant manufacturer's written instructions for mixing multi-component sealants.
   2. Thoroughly mix components before use.
   3. Add entire contents of activator can to base container. Do not mix partial units.
   4. Mix contents for minimum of five minutes or as recommended by sealant manufacturer, until color and consistency are uniform.

3.3 INSTALLATION

A. Install joint sealants after adjacent areas have been cleaned and before joint has been cleaned and primed, to ensure calking and sealant joints will not be soiled. Replace calking and sealant joints soiled after installation.

B. Comply with sealant manufacturer's written instructions except where more stringent requirements are shown or indicated in the Contract Documents, and except where manufacturer's technical representative directs otherwise, only as acceptable to ENGINEER.

C. Prime or seal joint surfaces as shown on approved Shop Drawings and approved other submittals. Do not allow primer or sealer to spill or migrate onto adjoining surfaces. Allow primer to dry prior to applying sealants.

D. Apply masking tape before installing primer, in continuous strips in alignment with joint edge to produce sharp, clean interface with adjoining materials. Remove tape immediately after joints have been sealed and tooled as directed.

E. Confirm that compressible filler is installed before installing sealants. Refer to Section 04 00 05, Masonry, for locations.

F. Do not install sealants without backer rods and bond breaker tape.

G. Roll back-up rod stock into joint to avoid lengthwise stretching. Do not twist, braid, puncture, or prime backer rods.

H. Employ only proven installation techniques that will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

I. Install sealants to depths recommended by sealant manufacturer but within the following general limitations, measured at the center (thin) section of bead.
   1. For horizontal joints in sidewalks, pavements, and similar locations sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to depth equal to 75 percent of joint width, but not more than 5/8-inch deep or less than 3/8-inch deep.
   2. For vertical joints subjected to normal movement and sealed with elastomeric sealants and not subject to traffic, fill joints to a depth equal to 50 percent of joint width, but not more than 1/2-inch deep or less than 1/4-inch deep.

J. Remove excess and spillage of compounds promptly as the Work progresses.

K. Cure calking and sealant compounds in compliance with manufacturer's instructions and recommendations, to obtain high-early bond strength, internal cohesive strength, and surface durability.

3.4 EXISTING JOINTS

A. Mechanically remove existing sealant and backer rod.

B. Clean joint surfaces of residual sealant and other contaminates capable of affecting sealant bond to joint surface.

C. Conduct laboratory pre-construction compatibility and adhesion testing on joint surfaces in accordance with Paragraph 3.1.B of this Section.

D. Allow joint surfaces to dry before installing new sealants.

3.5 FIELD QUALITY CONTROL

A. Post-construction Field Adhesion Testing: Before installing elastomeric sealants, field-test joint sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed elastomeric sealant joints as follows:
      a. Perform ten tests for the first 1,000 feet of joint length for each type of elastomeric sealant and joint substrate.
      b. Perform one test for each 1,000 feet of joint length thereafter, and minimum of one test per each floor per elevation.
      c. Test Method: Test joint sealants according to Method A, Field-applied Sealant Joint Hand Pull Tab, and Method D, Water Immersion in Appendix X1 of ASTM C1193. For joints with dissimilar substrates, verify adhesion to each substrate separately by extending cut along one side and verifying adhesion to opposite side. Repeat procedure for opposite side.
      d. Inspect joints for complete fill, absence of voids, and joint configuration complying with specified requirements. Record results in a log of field adhesion tests.
      e. Inspect tested joints and report on whether:

1) Sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
2) Sealants filled the joint cavities and are free of voids.
3) Sealant dimensions and configurations comply with specified requirements.

f. Record test results in a log of field adhesion tests. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

g. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

h. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other requirements will be satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

i. Do not proceed with installation of elastomeric sealants over joint surfaces that have been painted, lacquered, waterproofed, or treated with water repellent or other treatment or coating unless a laboratory test for durability (adhesion), in compliance with FS TT-S-00227, has successfully demonstrated that sealant bond is not impaired by the coating or treatment. If laboratory test has not been performed or shows bond interference, remove coating or treatment from joint surfaces before installing sealant.

B. Water Leak Testing: Field test for water leaks as follows:

1. Flood the joint exposure with water directed from a 3/4-inch diameter garden hose, without nozzle, held perpendicular to wall face, two feet from joint and connected to water system with 30 psi minimum normal water pressure. Move stream of water along joint at an approximate rate of 20 feet per minute.
2. Test approximately five percent of total joint system, in locations that are typical of every joint condition, and that can be inspected easily for leakage on opposite face. Conduct test in presence of ENGINEER, who will determine actual percentage of joints to be tested and actual period of exposure to water from hose, based on extent of observed leakage or lack of observed leakage.
3. Where nature of observed leaks indicates potential of inadequate joint bond strength, ENGINEER may direct that additional testing be performed at a time when joints are fully cured, and before Substantial Completion.

3.6 ADJUSTING AND CLEANING

A. Where leaks and lack of adhesion are evident, replace sealant.

B. Clean adjacent surfaces of sealant and soiling resulting from the Work. Use solvent or cleaning agent recommended by sealant manufacturer. Leave all finish Work in neat, clean condition.

C. Protect sealants during construction so that they will be without deterioration, soiling, or damage at time of readiness for final payment of the Contract.

3.7 PROTECTION

A. During and after curing period, protect joint sealants 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 Substantial Completion. 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 original Work.

+ + END OF SECTION + +

SECTION 08 11 19

STAINLESS STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install stainless steel doors and frames.
   2. Extent of stainless steel doors and frames is shown.
   3. Types of products required include the following:
      a. Seamless, stainless steel, polystyrene core, flush doors.
      b. Miscellaneous supports; special, supplemental, and standard finish hardware reinforcements and preparation items; fasteners and accessories; all for high frequency, high-endurance use.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the stainless steel doors and frames Work.

C. Related Sections:
   1. Section 04 00 05, Masonry.
   2. Section 08 71 00, Door Hardware.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. ANSI A250.4: Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.
   2. ANSI/NAAMM-HMMA 866: Guide Specifications for Stainless steel Doors and Frames.
   3. ASTM A 240/A 240M: Specification for Chromium and Chromium-Nickel Stainless Steel.
   4. Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
   5. ASTM A 1008/A 1008M: Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
   6. ASTM A 1011/A 1011M: Specification for Steel, Sheet and Strip, Hot Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
   7. ASTM C 143/C 143M: Test Method for Slump of Hydraulic Cement Concrete.
   8. ASTM C 476: Specification for Grout for Masonry.

9. ASTM C 1363: Test Method for the Thermal Performance of Building Materials and Envelope. Assemblies by Means of a Hot Box Apparatus.
10. ASTM E 84: Test Method for Surface Burning Characteristics of Building Materials.
11. ASTM E 329: Specification for Agencies Engaged in Construction Inspection and/or Testing.
12. ASTM F 593: Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
13. ASTM F 5942: Specification for Stainless Steel Nuts.
14. ASTM F 738M: Specification for Stainless Steel Metric Bolts, Screws, and Studs.
15. ASTM F 836M: Specification for Style 1 Stainless Steel Metric Nuts.
16. ASTM F 2329: Specification for Zinc Coating, Hot-Dip, Requirements for Applications to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts and Special Threaded Fasteners.
17. HMMA 820: Metal Doors and Frames.
18. HMMA 831: Recommended Hardware Locations for Custom Hollow Metal Doors and Frames.
19. HMMA 866, Guide Specifications for Stainless Steel Hollow Metal Doors and Frames.
20. UL 1784: Air Leakage Tests of Door Assemblies.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five years experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.
   2. Provide stainless steel doors, frames, and accessories manufactured by a single firm specializing in the production of this type of Work and complying with specified standards of ANSI, HMMA, NFPA, and UL.
   3. Provide stainless steel doors and frames from a manufacturer who is a member of HMMA.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single stainless steel doors and frames manufacturer.
   2. The stainless steel doors and frames equipment manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the stainless steel doors and frames manufacturer.

C. Testing Agency Qualifications: The independent testing agency shall demonstrate to ENGINEER'S satisfaction, based on evaluation of criteria submitted by testing agency, that it has the experience and capability to satisfactorily conduct the testing indicated in accordance with ASTM E 329, without delaying the Work.

D. Source Quality Control:
   1. Provide stainless steel door and frame products from a manufacturer who will provide test certificates for published fire, sound, hurricane and structural data covering systems designed and constructed according to its published specifications.

E. Regulatory Requirements:
   1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg. of water.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Elevations of each door design.
      b. Details of doors, including vertical and horizontal edge details and metal thicknesses.
      c. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
      d. Locations of reinforcement and preparations for hardware.
      e. Details of each different wall opening condition.
      f. Details of anchorages, joints, field splices, and connections.
      g. Details of accessories.
      h. Details of moldings, removable stops, and glazing.
      i. Details of conduit and preparations for power, signal, and control systems.
      j. Provide a schedule of doors and frames using same reference numbers for details and openings as those shown.
   2. Samples:
      a. Hollow metal corner section of frame, 12-inches by 12-inches minimum, showing all special, supplemental, and standard reinforcements, attachments, supports and anchors specified. Provide corner sample for each type of frame specified. Provide sample for each type of frame specified. Show profile, corner joint, floor and wall anchors, and silencers.
      b. Cut-away section of all door types specified, showing internal construction, edge details and reinforcements for butts, closers, and similar items of finished hardware, 2 foot-0 inches by 2 foot-0 inches minimum. Include louver sections, vision panel and glazing stops. Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement.
      c. ENGINEER reserves the right to require samples showing fabrication techniques and workmanships of all component parts, and the detailing and fabrication of accessories and auxiliary items for all door and frame Work, before fabrication of the Work proceeds.

B. Informational Submittals: Submit the following:
   1. Test and Evaluation Reports:
      a. Laboratory test report for required performance and specified feature verification for doors and frames selected at random by ENGINEER for testing.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.
   2. Deliver stainless steel doors and frames cartoned or crated to provide protection during transit and job storage.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Store stainless steel doors and frames at the Site under cover.
   3. Place units up off floors in a manner that will prevent rust and damage.
   4. Avoid the use of non-vented plastic or canvas shelters, which could create a humidity chamber. If cardboard wrapper on the door becomes wet, remove the carton immediately.
   5. Provide a 1/4-inch space between stacked doors to promote air circulation.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for stainless steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Coordinate the wiring of electrified hardware. Deliver such items to Project site in time for installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Product and Manufacturer: Provide one of the following:
   1. Stainless Steel Doors and Frames by The Next Door Company.
   2. Stainless Steel Doors and Frames by Stainless Doors, Incorporated, a Division of EMJC Industries.
   3. Stainless Tech Stainless Steel Doors and Frames by Ceco Door, an ASSA ABLOY Group Company.
   4. Or equal.

2.2 MATERIALS

A. Door Faces and Frames:
   1. Stainless-Steel Sheet: ASTM A 240/A 240M, austenitic stainless steel, 316.

B. Foam-Plastic Insulation: Manufacturer's standard polystyrene board insulation with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within door.

C. Grout: Refer to Section 04 00 05, Masonry.

D. Supports and Anchors: Formed stainless steel, ASTM A 240/A 240M.

E. Inserts, Bolts and Fasteners: Stainless steel complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group 1 or 4) for bolts and nuts.

F. Miscellaneous Accessories:
   1. Head Strut Supports: 3/8-inch by 2-inch stainless steel.
   2. Structural Reinforcing Members: Provide structural reinforcing members as part of frame assembly, where shown at mullions, transoms, or other locations that are to be built into frame.
   3. Head Reinforcing: For frames over 4 feet-0 inch wide, in masonry openings, provide continuous stainless steel channel or angle stiffener, not less than 12-gauge for full width of opening, welded to back of frame at head.
   4. Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.
   5. Plaster Guards: 26-gauge minimum stainless steel.

2.3 FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
   1. Finish: No. 4. Dull Satin.

2.4 FABRICATION

A. General:
   1. Fabricate stainless steel units to be rigid, neat in appearance and free for defects, warp or buckle. Accurately form metal to required sizes and profiles.
   2. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify Work that cannot be permanently factory-assembled before shipment, to assure proper assembly at the Site. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible.
   3. Exposed Fasteners: Unless otherwise shown or specified, do not use exposed fasteners in the Work. Where exposed fasteners are shown or specified, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.

B. Doors:
   1. Description: Stainless-steel doors, not less than 1-3/4 inches thick, of seamless, hollow-metal construction.
   2. Fabricate all stainless steel doors and panels in compliance with HMMA 866.
   3. Provide doors of two outer stretcher-leveled sheets, 16-gauge minimum. Construct doors with smooth, flush surfaces without visible joints or seams on exposed faces or edges, except around glazed or louvered panel inserts. Provide weep hole openings in the bottom of exterior doors to permit the escape of entrapped moisture.
   4. Vertical edges of doors shall be continuously welded, for the whole length of the door, and ground smooth.
   5. Reinforce inside of doors with polystyrene core, unless indicated, completely filling the inside of the door and laminated to the inside of both face panels with an adhesive. The honeycomb material shall have a crushing strength not less than 6,000 pounds per square foot and the lamination shall withstand not less than 1,100 pounds per square foot in shear.
   6. Welded Steel-Stiffened Core: 16-gauge vertical stiffeners extending full-door height, spaced not more than 6 inches apart, spot welded to face sheets a maximum of 5 inches O.C. Fill spaces between stiffeners with mineral-fiber insulation.
   7. Fabricate all doors with flush top and bottom closing channel, without exposed fasteners. Reinforce tops and bottoms of doors with inverted, flush-mounted, minimum 16-gauge, horizontal steel channels fastened to internal reinforcement channel and with 20-gauge closing plate spot-welded to closure channel. Close top and bottom edges to provide weather seal, as integral part of door construction or by addition of inverted steel channels and plates.
   8. Edge profiles shall be provided on both stiles of doors beveled 1/8-inch in 2-inches, except where other profiles are required for certification.
   9. Tolerances: HMMA 866.
   10. Performance: Level A, ANSI A250.4.

C. Frame Construction:
   1. Description: Fabricate stainless-steel frames of construction indicated, with faces of corners mitered and contact edges closed tight.
   2. Fabricate all stainless steel frames in compliance with HMMA 820 and as specified.
   3. Form frames of cold-rolled sheet material, 14-gauge minimum. Provide seamless frames for all Work, unless specifically specified and shown as permitting exposed fasteners.
   4. Provide stainless steel frames for doors, and other openings of size and profile as shown or specified.
   5. Fabricate frames with reinforced, mitered corners that are continuously arc-welded for the full depth and width of the frame, with bottom spreader bar; except provide drywall frames as specified.
   6. Grind all exposed welds flush and smooth.
      a. Provide two anchors at head of frames exceeding 3 foot-6 inches wide.
      b. Provide vertical steel head support struts extending from top of frame at each jamb to supporting construction above. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable bolted anchorage to frame jamb members.
   7. Head Reinforcing: Where installed in masonry, leave vertical mullions in frames open at the top so they can be filled with grout.
   8. Floor and Head Anchors: 14-gauge minimum, and of the following types:
      a. Monolithic Concrete Slabs: Clip-type, with two holes to receive fasteners, welded to bottom of jambs and mullions.
      b. Separate Topping Concrete Slabs: Adjustable-type with extension clips, allowing not less than 2-inches height adjustment. Terminate bottom of frames at finish floor surface.
   9. Head Strut Supports: Provide vertical steel struts extending from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable bolted anchorage to frame jamb members.
   10. Jamb Anchors: 16-gauge minimum, and of the following types:
      a. Masonry Construction: Adjustable, corrugated or perforated, stainless steel, T-shaped to suit frame size with leg not less than 2-inches wide by 10-inches long.
         1) Up to 60 inches high: 2 jamb anchors.
         2) Over 60 up to 90 inches high: 3 jamb anchors.
         3) Over 90 up to 96 inches high: 4 jamb anchors.
         4) Over 96 inches high: 4 jamb anchors plus 1 for each 24 inches or fraction thereof over 96 inches.
   11. Rubber Door Silencers: Drill stop to receive three silencers on single-door frames and four silencers on double-door frames. Install plastic plugs to keep holes clear during construction.
   12. Plaster Guards: Provide manufacturer's standard stainless steel plaster guards or dust cover boxes.
   13. Tolerances: HMMA 866.

14. Performance: Level A, ANSI A250.4.

D. Door and Frame Hardware Preparation:
   1. General:
      a. Prepare stainless steel units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling, and tapping in accordance with approved Finish Hardware Schedule and templates provided by finish hardware supplier and as specified. Comply with applicable requirements of HMMA 831. Refer to Section 08 71 00, Door Hardware.
      b. Obtain approved hardware schedule, hardware templates, and samples of finish hardware where necessary to ensure correct detailing and fabrication of the stainless steel doors and frames, from finish hardware supplier.
   2. Doors:
      a. Preparation includes sinkages and cut-outs for mortised and concealed finish hardware and reinforcements for both concealed and surface-applied finish hardware.
      b. Drill and tap mortise reinforcements at factory, using templates.
      c. Detail and fabricate reinforcements with concealed connections designed to develop full strength of reinforcements for high-frequency applications.
      d. Reinforce doors for required finish hardware, with minimum gauges of reinforcements provided as follows:
         1) Hinges: Stainless steel plate 3/16-inches thick by 1-1/4-inches wide by 10-inches longer than hinge and secured by not less than six spot or projection welds with top hinge further reinforced with a high-frequency back-up reinforcement.
         2) Mortise Locksets and Dead Bolts: 12-gauge stainless steel sheet, secured with not less than four spot or projection welds.
         3) Surface-Applied Closers and Overhead Stops: 3/16-inch stainless steel plate, not less than 10-inches long, secured with not less than six spot or projection welds.
         4) Push Plates and Bars: 16-gauge stainless steel sheet secured with not less than two spot or projection welds.
         5) Surface Panic Devices: 16-gauge stainless sheet steel secured with not less than two spot or projection welds.
         6) Automatic Door Bottoms: Reinforce for mortise-type units with 14-gauge stainless steel, and 16-gauge for surface-applied units.
   3. Frames:
      a. Reinforce frames for required finish hardware with minimum gauges as follows:
         1) Hinges: Special full width of frame, 3/16-inch thick stainless steel plate by 8-inches longer than hinge, secured to both rabbets by not less than twelve spot or projection welds.
         2) Strike Plate Clips: 14-gauge stainless steel plate by 1-1/2-inches wide by 3-inches long with mortar guard boxout secured with not less than six spot or projection welds.

3) Surface-Applied Closers: 3/16-inch stainless steel plate, secured with not less than six spot or projection welds. Coordinate closer function and presence of overhead stops and weather-stripping, with location of reinforcement plate.

2.5 ACCESSORIES

A. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the substrate and conditions under which stainless steel doors and frames are to be installed and notify ENGINEER, in writing, of any conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

B. Frames that are bowed, twisted or otherwise unacceptable shall be removed from the Site and replaced with properly constructed frames.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded stainless steel frames for squareness, alignment, twist, and plumbness to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a 90 degree from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install stainless-steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with ANSI/NAAMM-HMMA 866 and manufacturer's written instructions.
   1. Do not install doors and frames until all the Work, which could damage doors and frames, has been completed.
   2. Provide temporary doors until construction sequencing allows installation of permanent doors and frames.
   3. Do not proceed with the installation of permanent stainless steel doors until CONTRACTOR can provide finished Work complying with all requirements of these Specifications.
   4. Protect built-in frame Work with temporary wood protection.

B. Stainless-Steel Frames: Install stainless-steel frames of size and profile indicated.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-protection-rated openings, install frames according to NFPA 80.
      b. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c. Install frames with removable glazing stops located on secure side of opening.
      d. Install door silencers in frames before grouting.
      e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
      f. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      g. Apply corrosion-resistant coating to backs of grout-filled frames.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.
      a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors, if so indicated and approved on Shop Drawings.
   3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
   4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
   5. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
7. Grouted Frames: Solidly fill space between frames and substrate with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
8. Installation Tolerances: Adjust stainless-steel frames for squareness, alignment, twist, and plumb to the following tolerances:
    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16, measured at jambs at floor.

C. Stainless-Steel Doors: Fit non-fire-rated doors accurately in frames with the following clearances:
1. Non-Fire-Rated Doors:
    a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

3.4 ADJUSTMENT AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work including stainless-steel doors or frames that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off stainless-steel doors and frames immediately after installation.

C. Stainless Steel Touchup: Immediately after erection, smooth any abraded areas of stainless steel and polish to match undamaged finish.

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SECTION 08 31 00

ACCESS DOORS AND PANELS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified and required to furnish and install all access doors and panels Work.
   2. Extent of access doors and panels is shown.
   3. Types of products required include the following:
      a. Universal wall and ceiling access doors.
      b. Miscellaneous hardware, accessories and fasteners.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the access doors and panels Work.

C. Related Sections
   1. Section 09 26 16, Gypsum Board Assemblies.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. ASTM A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   3. ASTM A924, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
   4. ASTM E 329, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
   5. NFPA 80, Standard for Fire Doors and Other Opening Protectives.
   6. UL, Fire Resistance Directory.
   7. Warnock Hersey Testing Services.

1.3 QUALITY ASSURANCE

A. Manufacturer’s Qualifications:
   1. Manufacturer shall have a minimum of five years experience producing substantially similar access doors and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single access door manufacturer.
   2. The access door manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the access door manufacturer.

C. Testing Agency Qualifications: The independent testing agency shall demonstrate to ENGINEER'S satisfaction, based on evaluation of criteria submitted by testing agency, that it has the experience and capability to satisfactorily conduct the testing indicated in accordance with ASTM E 329, without delaying the Work.

D. Source Quality Control:
   1. Provide access door products from a manufacturer who will provide test certificates for published fire data covering systems designed and constructed according to its published specifications.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Copies of manufacturer's technical data and installation instructions for each type of access door and panel assembly. Transmit copy of the instructions for each type to the installer. Provide setting drawings, templates, instructions and directions for installation of anchorage devices.

B. Informational Submittals: Submit the following:
   1. Test Reports:
      a Laboratory test report for required performance and specified feature verification for doors and frames selected at random by ENGINEER for testing.
      b. Test reports indicating compliance with UL and Warnock-Hersey tests.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.
   2. Deliver access doors and frames cartoned or crated to provide protection during transit and job storage.

B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Store access doors at the Site under cover.
3. Place units up off floors in a manner that will prevent rust and damage.
4. Avoid the use of non-vented plastic or canvas shelters, which could create a humidity chamber. If cardboard wrapper on the door becomes wet, remove the carton immediately.
5. Provide a 1/4-inch space between stacked doors to promote air circulation.

C. Acceptance at Site:
1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for access door frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Universal Non-Fire-Rated Wall and Ceiling Access Doors: Products and Manufacturers: Provide products of one of the following:
1. Model DSC- 214M Karp Associates, Incorporated.
2. B-NT Series by Babcock- Davis Incorporated.
3. Or equal.

2.2 MATERIALS

A. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS) with A60 (ZF180) zinc-iron-alloy (galvannealed) coating or G60 (Z180) mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924.
1. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

2.3 FABRICATION

A. Description:
   1. Provide access door and panel assemblies manufactured as integral units and complete with all components and accessories ready for installation.
   2. Provide anchors or make provisions in frame for anchoring to adjacent construction. Provide size, number and location of anchors on four sides to secure access door in opening. Provide anchors as required by fire test.

B. Universal Non-fire-rated Wall and Ceiling Access Doors: Provide the following for concrete, masonry and wallboard:
   1. Flush Door Panels: 16-gauge factory-primed, galvanized steel door recessed 1-inch for wallboard.
   2. Frames: 16-gauge factory-primed, galvanized steel with continuous wallboard bead with concealed flanged.
   3. Finish Hardware:
      a. Hinge: Exposed continuous stainless steel piano hinge.
      b. Screwdriver-operated cam latch.
   4. Size:
      a. Ceiling: 24-inches by 30-inches.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR must examine the areas and conditions under which access doors are to be installed and notify ENGINEER, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 INSTALLATION

A. Comply with manufacturer's instructions for installation of access doors and panels.

B. Coordinate installation with work of other trades. Refer to Section 09 21 16, Gypsum Board Assemblies for substrate installation.

C. Set frames accurately in position and securely attach to support with face panels plumb or level in relation to adjacent finish surfaces.

3.3 ANCHORAGE

A. Secure frames to adjacent construction using anchors attached to frames or by use of bolts or screws through the frame members.

B. Type, size and number of anchoring device suitable for the material surrounding the opening, maintain alignment, and resist displacement during normal use of access door.

C. Anchors for fire rated access doors shall meet requirements of applicable fire test.

3.4 ADJUSTMENT AND CLEANING

A. Adjust hardware and panels after installation for proper operation.

B. Remove and replace panels or frames, which are warped, bowed or otherwise damaged.

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SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install door hardware. Furnish door hardware for all doors in compliance with these Specifications herein.
   2. Extent of door hardware is specified. Door hardware is defined to include all items known commercially as door hardware, except special types of unique and non-matching hardware specified in the same Section as the door and door frame.
   3. Types of products required include the following:
      a. Mortise hinges.
      b. High-security mortise locksets.
      c. Panic exit devices.
      d. Heavy-duty, overhead, surface-mounted, door closers.
      e. Cylinders for doors specified in other Sections.
      f. Stripping and seals.
      g. Thresholds.
      h. Silencers.
      i. Miscellaneous items and accessories for a complete installation functioning in compliance with the requirements of governing authorities having jurisdiction at the Site.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, the door hardware.
   2. Coordinate the Work of other Sections to provide clearances and accurate positioning of recessed or cast-in-place items.

C. Related Sections:
   1. Section 08 11 13, Hollow Metal Doors and Frames.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. ANSI A117.1, Accessible and Usable Buildings and Facilities.
   2. ANSI/BHMA A156.1, Butts and Hinges.
   3. ANSI/BHMA A156.3, Exit Devices.
   4. ANSI/BHMA A156.4, Door Controls - Closers.

5. ANSI/BHMA A156.5, Auxiliary Locks and Associated Products.
6. ANSI/BHMA A156.6, Architectural Door Trim.
7. ANSI/BHMA A156.7, Template Hinge Dimensions.
8. ANSI/BHMA A156.8, Door Controls - Overhead Stops and Holders.
9. ANSI/BHMA A156.13, Mortise Locks and Latches, Series 1000.
10. ANSI/BHMA A156.16, American National Standard for Auxiliary Hard-ware.
11. ANSI/BHMA A156.18, Hardware - Materials and Finishes.
12. ANSI/BHMA A156.21, Thresholds.
13. ANSI/BHMA A156.22, Door Gasketing and Edge Seal Systems.
14. ANSI/BHMA A156.24, Delayed Egress Locks.
16. ANSI/BHMA A156.26, Continuous Hinges.
17. ANSI/DHI A115.1, Preparation of Mortise Locks in 1-3/8-inch and 1-3/4-inch Standard Steel Doors and Frames.
18. ANSI/NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
19. ASTM E329, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.
20. BMHA, Certified Product Directory.
21. DHI, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.
22. DHI, Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.
23. DHI, Sequencing and Format for the Hardware Schedule.
24. FF-TT-S-00227,
25. HMMA 830, Hardware Preparation and Locations for Hollow Metal Doors and Frames.
26. NIST, U. S. Standard.
28. NFPA 80, Fire Doors and Fire Windows.
29. NFPA 101, Life Safety Code.
30. SDI 109, Hardware for Standard Steel Doors and Frames.
31. SDI 118, Basic Fire Door Requirements.
32. UL 10B, Fire Tests of Door Assemblies.
33. UL 10C, Positive Pressure Fire Tests of Door Assemblies.
34. UL 305, Panic Hardware.
35. UL, Building Materials Directory.
36. UL, List of Inspected Fire Protection Equipment and Material.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Provide door hardware and accessories manufactured by firms specializing in the production of this type of Work and complying with specified standards of ANSI, BHMA, DHI, NFPA, HMMA, SDI and UL.
   2. Provide door hardware from manufacturers who are members of BHMA and participate in BHMA certification programs.

B. Installer's Qualifications:
   1. The door hardware installer shall have in his employ an architectural hardware consultant. The architectural hardware consultant shall be a member of the

Door and Hardware Institute, (DHI), who has passed the DHI certification examine and successfully completed an apprenticeship program. The architectural hardware consultant shall be responsible for preparing door hardware schedules and Shop Drawings and be present at the Site for the purpose of checking and supervising the Work of the installer during the time of installation and adjustment of the door hardware Work, and shall prepare a written field report on status of completed door hardware installation as specified.

2. Submit name and qualifications of the installer to ENGINEER.

C. Architectural Hardware Consultant Qualifications:
   1. A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

D. Component Supply and Compatibility:
   1. Finish hardware equipment manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   2. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the finish hardware manufacturer.

E. Testing Agency Qualifications: The independent testing agency shall demonstrate to ENGINEER'S satisfaction, based on evaluation of criteria submitted by testing agency, that it has the experience and capability to satisfactorily conduct the testing indicated in accordance with ASTM E 329, without delaying the Work.

F. Regulatory Requirements:
   1. Provide door hardware for fire-resistance-rated openings in compliance with NFPA 80.
   2. Provide only door hardware that has been tested, listed and labeled by UL for the types and sizes of doors required, and complies with the requirements of the door and door frame labels.
   3. Modify features of door hardware items specified, and provide additional accessories and features as required to meet UL and NFPA requirements, at no additional cost to the OWNER.
   4. Codes: Comply with applicable requirements of codes.

G. Source Quality Control:
   1. Obtain each type of door hardware item from only one manufacturer.
   2. Provide door hardware schedule, for submission to, and for approval by, ENGINEER, prepared in compliance with DHI standards.
   3. Comply with specified BHMA standards.

H. Requirements of Regulatory Agencies:

1. Provide finish hardware for fire-resistance-rated openings in compliance with NFPA 80.
2. Provide only finish hardware that has been tested, listed and labeled by UL for the types and sizes of doors required, and complies with the requirements of the door and door frame labels.
3. Modify features of finish hardware items specified, and provide additional accessories and features as required to meet UL and NFPA 80 requirements, at no additional cost to the OWNER.
4. Test Pressure: After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches or less above the sill.

I. Preconstruction and Keying Conference: Conduct conference at Project site to comply with requirements in Section 01 31 19.13, Preconstruction Conference. In addition to OWNER, CONTRACTOR, and ENGINEER, conference participants shall also include Architectural Hardware Consultant and OWNER's security consultant. Review methods and procedures related to door hardware including, but not limited to, the following:
   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 required testing, inspecting, and certifying procedures.
   3. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
      a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      b. Preliminary key system schematic diagram.
      c. Requirements for key control system.
      d. OWNER entities responsible for signing off on keying and authorization to allow copies of keys.
      e. Address for delivery of keys.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Copies of the Door Hardware Schedule in the manner and format specified, complying with the actual construction Progress Schedule requirements (for each draft). Include explanation of abbreviations, symbols, and codes used to present scheduled information.
         1) Prepare and submit Door Hardware Schedule in compliance with HDI standards.
      b. Based on the door hardware requirements specified, organize the final Door Hardware Schedule into "hardware sets," indicating complete designation of every item required for each door or opening. Furnish initial draft of schedule at the earliest possible date, in order to facilitate the fabrication of other Work (such as hollow metal frames) which may be critical in the Project Schedule. Furnish final draft of schedule after

Samples, manufacturer's data sheets, coordination with Shop Drawings for other Work, delivery schedules and similar information have been completed and accepted.

c. Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.

d. Include a separate key schedule, showing clearly how OWNER'S final instructions on keying of locks have been fulfilled.

e. Door Hardware Schedules are intended for coordination of the Work. Review and acceptance by ENGINEER does not relieve CONTRACTOR of responsibility to fulfill the requirements as shown and specified.

2. Product Data:

a. Copies of manufacturer's data for each item of door hardware. Include whatever information may be required to show compliance with specified requirements, and include instructions for installation and for maintenance of operating parts and exposed finishes. Include mounting heights and locations for each item of door hardware. Provide ENGINEER with latest complete technical catalogue of all available door hardware manufactured by proposed manufacturers, even if manufacturer specified by ENGINEER is submitted by CONTRACTOR to perform the Work. Furnish templates to fabricators of other Work, which is to receive door hardware.

3. Samples: Submit the following:

a. Actual unit of each door hardware item specified incorporating all standard and special features and finishes specified, demonstrated and identified by manufacturer's representative to ENGINEER. Samples shall be presented at time of Shop Drawing submittal, as ENGINEER will not review or approve Shop Drawings without concurrent sample submissions.

b. Approved samples may be incorporated into the door hardware Work.

c. ENGINEER'S review will be for appearance and for general compliance with required features. Compliance with all other requirements is the responsibility of CONTRACTOR.

B. Informational Submittals: Submit the following:

1. Test and Evaluation Reports:

a. Certified independent laboratory test reports for BHMA certification program and certification tests for each type of product specified.

2. Site Quality Control Submittals:

a. Field Report: Architectural Hardware Consultant's Report.

3. Qualifications Statements:

a. Installer.

C. Closeout Submittals: Submit the following:

1. Operation and Maintenance Documentation: Upon completion of the Work, furnish five copies of detailed maintenance manuals, including the following information:

a. Product name and manufacturer.
b. Name, address, e-mail address and telephone number of manufacturer and local distributor.
c. Detailed procedure for routine maintenance and cleaning.
d. Detailed procedures for repairs such as dents, scratches and staining.
e. Parts identification manual and maintenance manuals for each piece of door hardware.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
1. Deliver materials to the Site to ensure uninterrupted progress of the Work.
2. Deliver all items of door hardware in manufacturer's original, undamaged packages, bearing accurate representation of the item within each package.
3. Pack each piece of door hardware separately, complete with screws, keying, instructions and templates, tagged to correspond with items submitted on approved Shop Drawings and as specified.

B. Storage and Protection:
1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Provide secure storage area for door hardware items, secured by locks and accessible only to door hardware installer, ENGINEER and CONTRACTOR.
3. Store door hardware in manufacturers' original packages.

C. Acceptance at Site:
1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Items that arrive in a damaged condition shall be removed from the Site and not offered again for acceptance. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.6 COORDINATION

A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.7 WARRANTY

A. Special Warranty: Manufacturer'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. Failures include, but are not limited to, the following:
a. Structural failures including excessive deflection, cracking, or breakage.

b. Faulty operation of operators and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: 3 years from date of Substantial Completion, except as follows:
   a. Exit Devices: 2 years from date of Substantial Completion.
   b. Manual Closers: 10 years from date of Substantial Completion.

1.8 MAINTENANCE

A. Extra Materials
   1. None required.

B. Maintenance Service
   1. Maintenance Instructions: Furnish a complete set maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
   2. Maintenance Service: Beginning at Substantial Completion, provide 6 months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Criteria:
   1. Where the door, shape, size, fire-resistance-rating, frequency of use, or function of a member receiving door hardware is such as to prevent, or make unsuitable, the types of door hardware specified, furnish similar types having as nearly as practicable the same operation but of type or kind more appropriate to the design intention and requirements of governing authorities having jurisdiction at the Site. Clearly identify and highlight to ENGINEER all such required modifications on Shop Drawings submitted for approval.
   2. If door hardware for any location is not specified, provide door hardware equal in design and quality to adjacent door hardware specified for comparable openings at no additional cost to OWNER.
   3. Furnish door hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements, as necessary for proper installation and function.
   4. Unless otherwise specified, comply with DHI, Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames and Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.

2.2 DETAILS OF CONSTRUCTION

A. General:
   1. Hand of Door: The Drawings show the swing or hand of each door leaf (left, right, reverse bevel, etc.). Furnish each item of door hardware for proper installation and operation of the door swing as shown.
   2. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with labels required by governing authorities having jurisdiction at the Site.
   3. Base Metals: Produce door hardware units of the basic metal and forming method specified, using the manufacturer's standard metal alloy, composition, temper and hardness. Do not substitute materials or forming methods for those specified.
   4. Fasteners: Manufacture door hardware to conform to published templates, generally prepared for machine screw installation. Do not provide door hardware, which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
   5. Furnish screws for installation, with each door hardware item. Provide Phillips flat-head screws except as otherwise specified. Finish exposed (exposed under any condition) screws to match the hardware finish or, if exposed in surfaces on other Work, to match the finish of such other Work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
   6. Provide fasteners which are compatible with both the unit fastened and the substrate, and which will not cause corrosion or deterioration of door hardware, base material or fastener.
   7. Provide concealed fasteners for door hardware units, which are not exposed when the door is closed, except to the extent no standard manufacturer units of the type specified are available with concealed fasteners. Do not use through bolts for installation where the bolt head or the nut on the opposite face is exposed in other Work under any condition, except where it is not possible to adequately reinforce the Work and use machine screws or concealed fasteners of another standard type to satisfactorily avoid the use of through bolts.
   8. Tools for Maintenance: Furnish two complete sets of specialized tools as required for OWNER'S continued adjustment, maintenance, removal and replacement of door hardware.

2.3 HARDWARE TYPES

A. Mortise Hinges:
   1. Templates and Screws: Provide only template-produced units.
   2. Base Metal: Except as otherwise specified, fabricate hinges from stainless steel and finish to match the latch and lock set.
   3. Number of Hinges: Provide three hinges on each door leaf of less than 60-inches in height; provide one additional hinge for next 30-inches of door height or fraction thereof; provide two additional hinges for each 30-inches, or fraction thereof, for doors above 90-inches tall.

4. Hinge Size: Except as otherwise specified or as required to comply with UL and NFPA, provide hinges of the following sizes:
    a. Exterior Doors, Maximum 36-Inches Wide: 4-1/2-inch heavy-weight (0.180-inch).
5. Types of Hinges: Provide full-mortise type, ball-bearing hinges, swaged for mortise applications, inner leaf beveled, square cornered, unless manufacturer's recommendations indicate that half-mortise, half-surface, full-surface or other type should be used for the frame and door type or condition.
6. Hinge Pins: Except as otherwise specified, provide hinge pins as follows:
    a. Pins: Stainless steel.
    b. Exterior Doors: Non-removable pins. Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed.
    c. Tips: Slope ends of hinge barrel.
7. Conform to ANSI/BHMA A156.7.
8. Comply with UL, List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
9. Products and Manufacturers: Provide one of the following:
    a. FBB 199, FBB 191 by Stanley Commercial Hardware, Division of The Stanley Works.
    b. T4B3386, TB3313 by McKinney Products Company, an ASSA ABLOY Group company.
    c. Or equal.

B. High-Security Mortise Lock Sets:
1. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with ADAAG.
2. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
3. Strikes: Provide manufacturer's standard wrought box strike, for each location and use shown. Provide stainless steel curved lip strikes, unless otherwise recommended by manufacturer, finished to match lock or latch set trim.
4. Lock Throw: Provide minimum of 3/4-inch anti-friction latch bolt and 1-inch dead bolt throw. Comply with UL requirements for throw of latch bolts and deadbolts on fire-resistance-rated openings.
5. Materials: Provide the following features and materials:
    a. Latch Bolt: Two-piece; mechanical; anti-friction, stainless steel.
    b. Dead Bolt: One-piece, stainless steel with two enclosed hardened-steel roller armor pins.
    c. Case: Wrought steel, zinc dichromatized.
    d. Cylinders: High-security; brass; pick- and drill-resistant; ANSI/BHMA A156.5 - E09211A.
    e. Armor Front: 8-inches by 1-1/4-inches wide, minimum; steel.
    f. Escutcheon: 8-inches by 2-1/2-inches wide by 3/16-inches thick, minimum; stainless steel, US 32D.
    g. Hubs: Sintered steel, copper infiltrated.
    h. Lever with Stop Pin: Brass, plated to match stainless steel, with additional built-in stop to prevent over-torquing of lever.

i. All components shall be of marine quality, wherever possible.

6. Backset: 2-3/4-inches.
7. Modify specified locks and latches to comply with UL, Building Materials Directory, and List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
8. Latches and Locks for Means of Egress Doors: Comply with NFPA 101.
9. Finish: US 32D satin.
10. Conform to ANSI/BHMA A156.13, Series 1000, Security Grade 1.
11. Products and Manufacturers: Provide one of the following:
    a. High Security SL8800 Mortise Lockset with Augusta - AUSL Lever Handles and Trim by Yale Commercial Locks and Hardware, an ASSA ABLOY Group company.
    b. ML2000 Series Mortise Lockset with Newport NSM Lever Handles and Trim by Corbin Russwin Architectural Hardware, an ASSA ABLOY Group Company.
    c. Or equal.

C. Panic Exit Devices:
1. Strikes: Provide manufacturer's standard wrought stainless steel jamb-mounted top latch bolt and bottom latch bolt for each location and use shown to allow independent opening and closing of each leaf of double doors with panic exit devices; complying with UL List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
2. Lock Throws: Provide minimum of 3/4-inch latch bolt throw complying with UL List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
3. Strikes: Provide manufacturer's standard wrought stainless steel jamb-mounted top latch bolt and bottom latch bolt for each location and use shown to allow independent opening and closing of each leaf of double doors with panic exit devices; complying with UL List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
4. Lock Throws: Provide minimum of 3/4-inch latch bolt throw complying with UL List of Inspected Fire Protection Equipment and Materials and NFPA 80 requirements.
5. Provide concealed vertical rod type exit device and mortise type exit devices as specified.
6. Provide the following features and materials:
    a. Latch Bolt: Two-piece; mechanical; anti-friction, stainless steel.
    b. Dead Bolt: One-piece, stainless steel with two enclosed hardened-steel roller armor pins.
    c. Case: Wrought steel, zinc dichromatized.
    d. Cylinders: High-security; brass; pick- and drill-resistant; ANSI/BHMA A156.5 - E09211A.
    e. Armor Front: 8-inches by 1-1/4-inches wide, minimum; steel.
    f. Escutcheon: 8-inches by 2-1/2-inches wide by 3/16-inches thick, minimum; stainless steel, US 32D.
    g. Hubs: Sintered steel, copper infiltrated.

h. Crossbar: Oval, seamless with interlocking expansion collets and roll pins; knurled, satin stainless steel, 0.062-inches minimum thickness, with steel reinforcing tube.
i. Concealed bolts: Minimum 1/2-inch diameter, stainless steel.

7. Backset: Provide minimum backset of 2-3/4-inches.
8. Finish: US 32D satin.
9. ANSI/BHMA: A156.3, Type 3 and Type 8, Grade 1; F08, entrance by lever, key locks or unlocks lever for entrances shown as accessible to people with disabilities as required by ADAAG; and F05, entrance by thumb piece, key locks or unlocks thumb piece.
10. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
11. Products and Manufacturers: Provide one of the following:
    a. 1530-L8 (F) and -T8 (F) Series Mortise Exit Devices and 1520(F) CVR Concealed Vertical Rod Exit Devices; with Escutcheon Trim and Augusta - ASL Lever Handles and Thumbpiece/Handle/Cylinder Unit by Yale Commercial Locks and Hardware, an ASSA ABLOY Group company.
    b. ED6600Series Mortise Exit Devices and ED 6800 Concealed Vertical Rod Exit Devices; with Escutcheon Trim and Newport – N4M Lever Handles and D Grip T7M Thumb piece/Handle/Cylinder Unit by Corbin Russwin Architectural Hardware, an ASSA ABLOY Group company.
    c. Or equal.

D. Cylinders and Keying System:
1. Review the keying system with OWNER'S and provide the type required (master, grandmaster or great grandmaster), either new or integrated with OWNER'S existing system. Confirm OWNER'S request to have keying match another OWNER facility (Flint Pump Station).
2. Furnish all locks with manufacturer's cylinders for interchangeable-core pin tumbler inserts. Furnish only temporary inserts for the construction period, and remove these before Substantial Completion. Construction control keys and cores shall not be part of OWNER'S permanent keying system. Permanent cores and keys shall be furnished to OWNER prior to Substantial Completion.
3. Comply with the OWNER'S instructions for master keying and, except as otherwise specified, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.
4. Permanent keys and cores shall be stamped with the applicable key mark for identification. These visual key control marks or codes shall not include the actual key cuts. Permanent keys shall also be stamped "DO NOT DUPLICATE".
5. Cylinder Material: Brass, bronze or Series 300 stainless steels.
6. Cylinder Features: Seven-pin, high-security, removable core.
7. Key Material: Nickel silver.
8. Key Quantity: Furnish three keys for each lock and five keys for each master and grandmaster system. Provide one extra key blank for each lock.

E. Overhead, Surface-Mounted, Door Closers:
   1. Provide all doors, unless specially shown or specified as being provided with floor-mounted or concealed overhead closers, with surface-mounted overhead door closers. Provide both active and inactive door leafs with closers.
   2. Size of Units: Except as otherwise specified, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather, and anticipated frequency of use.
   3. Where parallel arms are specified, and for closers on exterior doors, provide closer unit one size larger than recommended for use with standard arms.
   4. Use parallel arm arrangement for doors that would otherwise have the door closer appearing in finished corridors or entries.
   5. Comply with UL, Building Materials Directory, and List of Inspected Fire Protection Equipment and Materials, and NFPA 80. Modify closers specified as required.
   6. Provide hold open feature for all non-fire-resistant-rated doors, unless otherwise specified.
   7. Provide corner bracket mounting on exterior doors. Select all arms to clear weather-stripping, and overhead door holders.
   8. Provide long arm to allow door to swing 180 degrees where long arm will eliminate floor-mounted stops.
   9. Provide closers with spring power adjustment feature capable of increasing spring power 15 percent minimum in all closer sizes.
   10. Provide individual regulating valves for closing and latching speeds, and separate adjustable back check valve.
   11. Provide delayed closing action feature on all door closers. Position valve at top of closure.
   12. Provide the following materials and features:
      a. Full Metal Cover: Aluminum.
      b. Case: Cast-iron.
      c. Arms: Plated to match full metal covers.
      d. Other Parts: Steel.
      e. Extreme temperature fluid.
      f. Security torx machine screws.
      g. Ten-year warranty.
      h. Provide manufacturer's optional corrosion protection.
   13. Finishes: US 26D satin chrome. Color coordinate all arms and other accessories.
   14. Highly Corrosive Atmospheres: Provide all closers with specified manufacturer's optional corrosion protection.
   15. ANSI/BHMA: A156.4, C02011, in compliance with PT 1 and PT 4.
   16. Products and Manufacturers: Provide one of the following:
      a. DC8000 Series by Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
      b. 4040 Series by LCN Closers, an Ingersoll Rand Company.
      c. Or equal.

F. Weatherstrip Gasketing:
   1. Provide perimeter weather stripping at all exterior doors. Provide stripping and seals for interior doors where scheduled in List of Door Hardware Items at end of Part 3.
   2. Continuity of Stripping: Except as otherwise specified, stripping at each opening shall be continuous and without unnecessary interruptions at door corners and hardware.
   3. Replaceable Seal Strips: Resilient or flexible seal strip of every unit shall be easily replaceable and readily available from stocks maintained by the manufacturer.
   4. Provide bumper-type weather-stripping at jambs and head, including a resilient insert and metal retainer strip, surface-applied, of the following metal, finish and resilient bumper material:
      a. Housing: Extruded aluminum with clear anodized finish; 0.062-inch minimum thickness of main walls and flanges.
      b. Dimensions: 1-3/8-inches by 7/8-inches, stop-mounted.
      c. Seals: Closed-cell extruded silicone.
      d. ANSI/BHMA: A156.22, R3E264.
      e. Products and Manufacturers: Provide one of the following:
         1) No. 2891 APK (for parallel arms) by Pemko Manufacturing Company.
         2) No. 429A (for parallel arms) by Zero International.
         3) Or equal.
   5. Provide heavy-duty, surface-mounted, door-bottom sweep units of manufacturer's standard design, with fixed seal bar of the following material, retained in an extruded metal bar and capable of closing a 3/4-inch gap (from door bottom to floor or threshold). Components for mounting on doors as follows:
      a. Housing: Extruded aluminum, with mill aluminum finish.
      b. Seal: Neoprene.
      c. Mounting: Surface-mounted.
      d. ANSI/BHMA: A156.22, R3E344.
      e. Products and Manufacturers: Provide one of the following:
         1) No. 3151CN (interior) and No. 345ANB (exterior) by Pemko Manufacturing Company.
         2) Comparable items by Zero International.
         3) Or equal.

G. Thermal Barrier Thresholds:
   1. All exterior doors shall be provided with thermal barrier thresholds.
   2. Metal: Extruded aluminum.
   3. Surface Pattern: Fluted tread, manufacturer's standard.
   4. Provide countersunk stainless steel screws and expansion shields.
   5. Width: 5 1/8-inches wide and of length sufficient to span full width of rough openings, coped and scribed neatly at and around door frames.
   6. Construction:
      a. Two-piece, with ridgid vinyl keycomplying with manufacturer's recommendations.

7. Profile: Provide manufacturer's unit, which conforms to the minimum size and profile requirements specified.
    a. For doors equipped with panic hardware, including floor bolts, provide profile with stop bar of proper size and shape to function as the strike plate for the floor bolts.
8. Thickness: 1/2-inch.
9. ANSI/BHMA: A156.21, J12100.
10. Products and Manufacturers: Provide one of the following:
    a. 252X2AFG by Pemko Manufacturing Company.
    b. 625 A by Zero International.
    c. Or equal.

H. Silencers:
1. Provide silencers for all door frames.
2. Provide pneumatic design that, once installed, forms an air pocket to reduce noise.
3. Provide minimum of three per strike side of door jambs.
4. ANSI/BHMA: A156.16, BHMA 6.5, L03011.
5. Products and Manufacturers: Provide one of the following:
    a. SR64 by IVES Hardware, an Ingersoll-Rand Company.
    b. Series 307D by Hager Companies.
    c. Or equal.

I. Sealants: Provide elastomeric sealant complying with FS TT-S-00227, Type 2 (non-sag) Class A for use with thresholds.

2.3 HARDWARE FINISHES

A. Provide matching finishes for door hardware units at each door or opening, to the greatest extent possible in compliance with ANSI/BHMA A156.18.

B. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of door hardware exposed at the same door or opening. In general, match all items to the manufacturer's standard finish for the latch and lock set for color and texture.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the substrate to receive door hardware, and the conditions under which the Work will be performed, and notify ENGINEER, in writing, of unsatisfactory conditions. Do not proceed with the door hardware Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 PREPARATION

A. Templates: Furnish door hardware templates to each fabricator of doors, frames and other Work to be factory-prepared for the installation of door hardware. Check the Shop Drawings of such other Work, to confirm that adequate provisions are made for the proper installation of the door hardware.

B. Prepare Work to receive door hardware Work in compliance with ANSI/DHI A115.1.

C. Surface-Applied Door Hardware: NFPA 80: Drill and tap doors and frames according to ANSI A250.6.

3.3 INSTALLATION

A. Installer shall check and approve the installation before operation. Installer shall assure that the system operates to the OWNER'S satisfaction.

B. Mount door hardware units at heights recommended in, Door and Hardware Institute, “Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames” and “Recommended Locations for Builders’ Hardware for Custom Steel Doors and Frames", except as otherwise specified or required to comply with governing authorities having jurisdiction at the Site, HMMA 830 and ADAAG requirements.

C. Install each door hardware item in compliance with the manufacturer's instructions and recommendations and approved Shop Drawings. Wherever cutting and fitting is required to install door hardware onto or into surfaces that are later to be painted or finished in another way, install each item completely, then remove, and store in a secure place during the finishapplication. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.

G. Screw thresholds to substrate with No. 10 or larger screws, of the proper type for permanent anchorage and of bronze or stainless steel that will not corrode in contact with the threshold metal.

H. Set thresholds in a bead of elastomeric sealant to completely fill concealed voids and exclude moisture from every source. Do not plug drainage holes or block weeps. Remove excess sealant before sealant cures to a firm set.

I. Initial Adjustment: Adjust and check each operating item of door hardware and each door, to ensure proper operation or function of every unit. Lubricate moving parts with the type lubrication recommended by manufacturer (graphite-type if no other recommended). Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

J. Final Adjustment: Where door hardware installation is made more than one month prior to Substantial Completion, return to the Work during the week prior to acceptance or occupancy, and make a final check and adjustment of all door hardware items in each space and area. Clean and re-lubricate operating items as necessary to restore proper function and finish of door hardware and doors. Adjust door control devices to compensate for final operating of heating and ventilating equipment.

K. Provide manufacturer’s authorized representative to instruct and train OWNER'S personnel in proper adjustment and maintenance of door hardware during the final adjustment of door hardware.

L. Door hardware, which is blemished or defective, will be rejected even though it was set in place before defects were discovered. Remove and replace with new door hardware. Repair all resultant damage to other Work.

M. Continued Maintenance Service: Approximately six months after the acceptance of door hardware in each area, the installer, accompanied by the representative of the latch and lock manufacturer, shall return to the Project and re-adjust every item of hardware to restore proper function of doors and door hardware. Consult with and instruct OWNER'S personnel in recommended additions to the maintenance procedures. Clean and lubricate operational items wherever required. Replace door hardware items that have deteriorated or failed due to faulty design, materials or installation of door hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the performance or the door hardware.

3.4 FIELD QUALITY CONTROL

A. Provide a written field report, prepared by installer’s architectural hardware consultant, identifying actual condition, location, manufacturer, and product designation for each item of door hardware actually present on each door at the Site,

including whether door hardware is adjusted and operating properly, compared with each item referenced to approved Shop Drawings and Contract requirements.

B. Installer's hardware consultant shall provide opinions to, and assist ENGINEER in determining, acceptability of installation as Work proceeds. All comments and discussions, conversations and meetings with ENGINEER shall be included in written field report for submission to ENGINEER for review and approval at completion of door hardware installation.

C. As part of written field report to be submitted to ENGINEER for approval, recommend remedial actions for Work not in compliance with these Specifications. No payment for Work shall be made until remedial recommendations and actions have been approved by ENGINEER and incorporated into the Work.

3.5 LIST OF DOOR HARDWARE ITEMS

A. Scheduled items for each door are generic and rely on information specified above. The listing of hardware functions and types provided are only a general guideline for the final Door Hardware Schedule. CONTRACTOR shall submit a Door Hardware Schedule acceptable to all governing authorities having jurisdiction at the Site.

B. Provide the following door hardware items:
   1. Electrical Building.
      a. Door No. 101-1, Exterior, 3'-0"x7'-2", Stainless Steel.
         1) Mortise Hinges.
         2) High-Security Mortise Lock Set.
         3) Panic Exit Device (F05).
         4) Cylinders and Keying System.
         5) Overhead, Surface-Mounted Door Closers.
         6) Stripping and Seals.
         7) Thermal Barrier Threshold.
         8) Silencers.

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SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install gypsum board assemblies. The Work also includes:
      a. Providing openings in gypsum board assemblies to accommodate the Work under this and other Sections, and building into gypsum board assemblies all items to be embedded in or penetrate gypsum board assemblies.
   2. Extent of gypsum board assemblies is shown.
   3. Types of products required include:
      a. Various types of interior ceiling gypsum board.
      e. Joint reinforcement and finish system.
      g. Sealant system for restriction of air, sound, or smoke passage through joints.
      h. Auxiliary materials, trim, and fasteners.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before gypsum board assemblies Work.

C. Related Sections:
   1. Section 07 21 05, Building Insulation.
   2. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI A108.11, Interior Installation of Cementitious Backer Units.
   2. ANSI A118.9, Test Methods and Specifications for Cementitious Backer Units.
   3. ASTM C11, Terminology Relating to Gypsum and Related Building Materials and Systems.
   4. ASTM C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   5. ASTM C475/C475M, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
   6. ASTM C514, Specification for Nails for the Application of Gypsum Board.

7. ASTM C665, Specifications for Mineral Fiber Blanket, Loose-Fill and Spray-Applied Insulation.
8. ASTM C754, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
9. ASTM C834, Specification for Latex Sealants.
10. ASTM C840, Specification for Application and Finishing of Gypsum Board.
11. ASTM C919, Practice for Use of Sealants in Acoustical Applications.
12. ASTM C954, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033-in. (0.84 mm) to 0.112-in (2.84mm) in Thickness.
13. ASTM C1002, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Metal Studs.
14. ASTM C1047, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
15. ASTM C1177/C1177M, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
16. ASTM C1178/C1178M, Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
17. ASTM C1396, Specification for Gypsum Board.
18. ASTM D578, Specification for Glass Fiber Strands.
19. ASTM D3273, Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
20. ASTM D4977, Test Method for Granule Adhesion to Mineral Surfaced Roofing by Abrasion.
21. ASTM D5034, Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
22. ASTM D5035, Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method).
23. ASTM D5420, Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
24. ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.
25. ASTM E90, Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
26. ASTM E119, Test Methods for Fire Tests of Building Construction and Materials.
27. ASTM E413, Classification for Rating Sound Insulation.
28. ASTM E488, Test Methods for Strength of Anchors in Concrete and Masonry Elements.
29. ASTM E695, Test Method of Measuring Relative Resistance of Wall, Floor and Roof Construction to Impact Loading.
30. GA-214, Recommended Levels of Gypsum Board Finish.
31. GA-216, Application of Gypsum Board.
32 GA-235, Gypsum Board Typical Mechanical and Physical Properties.
33. GA-530, Design Data.

34. UL, Fire Resistance Directory.

1.3 DEFINITIONS AND TERMINOLOGY

A. Definitions: The following terms are defined for this Section and supplement the terms defined in the General Conditions:
   1. Level of Finish: The designated finish of gypsum board assemblies established in ASTM C840.

B. Terminology:
   1. Terminology used in this Section is in accordance with ASTM C11, ASTM C754 and ASTM C840.
   2. The following words or terms are not defined but, when used in this Section, have the following meaning:
      a. “Critical lighting” is strong side lighting from windows or surface-mounted light fixtures.
      b. “Joint photographing” is the shadowing of finished joint areas through the surface decoration.
      c. “Drywall primer” is paint material specifically formulated to fill pores and equalize the suction difference between gypsum board surface paper and the compound used on finished joints, angles, fastener heads, and accessories and over skim coats.
      d. “Skim coat” is thin coat or joint compound, or material manufactured especially for this purpose, applied over the entire surface to fill imperfections in the joint Work, smooth the paper texture, and provide a uniform surface for decorating. Excess compound shall be immediately sheared off, leaving a film of skim coating compound completely covering the paper.
      e. “Spotting” is to cover fastener heads with joint compound.
      f. “Texture” is decorative treatment on gypsum board surface.
      g. “Texturing” is regular or irregular patterns typically produced by applying a mixture of joint compound and water, or proprietary texture materials including latex base texture paint, to a gypsum board surface previously coated with primer/sealer.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Provide gypsum board, accessories and trim manufactured by firms specializing in production of types of products specified, in compliance with reference standards listed in this Section.
      b. Provide gypsum board assemblies manufactured by firms that are members of the Gypsum Association (GA) and participate in GA’s certification programs.
   2. Installer:
      a. Engage a single installer that regularly performs gypsum board assemblies installation, with documented skill and successful

experience in installing types of materials required; and that employs only tradesmen who are trained, skilled, and have successful experience in installing types of materials specified.

b. Submit name and qualifications with the following information for at least three successful projects:
   1) Names and telephone numbers of owners, architects or engineers responsible for projects.
   2) Approximate contract cost of the gypsum board assemblies.
   3) Quantity (area) installed.

B Component Supply and Compatibility:

1. Furnish gypsum board assemblies materials from manufacturers who retains qualified technical personnel who will visit the Site for purpose of advising installer of proper procedures and precautions for using materials and who will assist ENGINEER with opinions on whether gypsum board assemblies Work conforms to the Contract Documents and manufacturer's recommendations.
2. Provide gypsum board assemblies materials from manufacturer who furnishes test certificates for published fire, sound, and structural data covering systems designed and constructed according to manufacturer's published specifications.
3. Furnish gypsum board assemblies materials from manufacturers whose products comply with GA-235.

C. Mock-Ups:

1. Before proceeding with purchasing materials and installing gypsum board assemblies and after ENGINEER's approval of Samples and other submittals, install 100 square foot Samples of each type of gypsum board assembly, including accessory trim, insulation specified in Section 07 21 05, Building Insulation, built-in items that may be specified in other Sections, and Section 09 91 00, Painting, indicating the final relationship and configurations of various parts and components and quality of workmanship to be achieved in the Work. Locate mock-ups in areas selected by ENGINEER to indicate representative installation of each type of gypsum board assembly.
2. Simulate finished lighting conditions for mock-up review.
3. Incorporate materials and methods of installation that are identical to Project requirements.
4. Obtain ENGINEER's approval of visual qualities of mock-up before starting installation of gypsum board assemblies. Retain and protect mock-up during construction as a standard for judging completed gypsum board assemblies Work. Do not alter or remove approved mock-ups.
5. Build as many mock-ups as required to obtain ENGINEER's approval. Disassemble rejected mock-ups and remove components from the Site. Do not incorporate rejected mock-up components into the Work. Approved mock-up may be incorporated into the Work.
6. Do not commence gypsum board assemblies installation without obtaining ENGINEER's approval of associated mock-up.

7. Remove and replace with new material gypsum board assemblies that do not meet standard of workmanship on the approved mock-up.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Show locations, fabrications, and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other units of Work.
   2. Product Data:
      a. Manufacturer's product data, specifications, and performance data for gypsum board assembly component required. Indicate compliance with requirements of reference standards included in this Section and requirements of authorities having jurisdiction.
      b. Include copies of certified test reports and other data as may be required to show compliance with the Contract Documents, including specified performance characteristics and physical properties.
      c. Manufacturer's design criteria for transverse loading capabilities of system assemblies indicating compliance with requirements of authorities having jurisdiction at the Site, for unbraced supported partition heights shown and system performance criteria specified.
   3. Samples: Sample submittals will be reviewed by ENGINEER for color, texture, and pattern only. Compliance with all other requirements is the responsibility of CONTRACTOR. Submit the following:
      a. Full-size Sample, each 12-inch long, for each trim accessory used in the Work.
      b. Mock-up(s).

B. Informational Submittals: Submit the following:
   1. Certificates.
      a. Certificates signed by manufacturer stating that materials meet or exceed requirements of the Contract Documents, including performance characteristics and criteria and physical requirements, and stating that materials have been provided as specified to meet thickness requirements, and application requirements.
   2. Supplier Instructions:
      a. Step-by-step joint treatment installation instructions for each Level of Finish specified for each area of the Work.
   3. Site Quality Control Submittals:
      a. Results of specified inspections and observations.
      b. Refer to Section 01 45 33.00CAOH, Code-Required Special Inspections and Procedures for reporting requirements.
   4. Qualifications Statements:
      a. Manufacturer, when required by ENGINEER.
      b. Installer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Comply with applicable requirements of reference standards used in this Section, Section 01 65 00, Product Delivery Requirements, and Section 01 66 00, Product Storage and Handling Requirements

1.7 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Temperature: Comply with the more stringent of ASTM C840 and manufacturer's written recommendations.
   2. Ventilation:
      a. Provide ventilation during and following application of adhesives and joint treatments.
      b. Use temporary air circulators in enclosed areas that lack natural ventilation.
      c. Under slow drying conditions, allow additional drying time between coats of joint treatment.
      d. Protect installed materials from drafts during hot, dry weather.
   3. Do not install panels that are any of the following: wet, moisture damaged, or mold damaged.
      a. Indications that panels are wet or moisture damaged includes, but is not limited to, discoloration, sagging, or irregular shape.
      b. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.8 SEQUENCING

A. Prior to starting installation of gypsum board, coordinate Work requiring openings, chases, frames, access panels, support, and similar integrated requirements, including heating and ventilating and electrical work.

B. Do not proceed with gypsum board installation until blocking, framing, bracing, and other supports for subsequently applied Work are installed.

C. Do not install gypsum board until thermal insulation to be concealed by board has been installed.

D. Install sound attenuation blankets where indicated and where required to achieve STC ratings or fire-resistance ratings, before installing gypsum board, unless blankets can be readily installed after board has been installed.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Description:
   1. Gypsum board assemblies include finishing systems for ceilings that consists of panels with various types of specially treated, hydrated calcium sulfate cores reinforced with paper laminated to both faces of panels and manufactured for direct application of decorative finishes, including a joint treatment system known as self-setting drywall finishing and other drywall trim system accessories, and a system of metal studs, furring and bracing.
   2. Complete systems shall conform to combined performance criteria in the Contract Documents.
   3. Recycled Content: Provide gypsum panel products with recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes minimum of:
      a. Gypsum: 25 percent by weight.
      b. Paper: 100 percent.
   4. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

B. Performance Criteria:
   1. General:
      a. Standards: Comply with GA-530 and ASTM standards specified in this Section, except when more-stringent requirements are mandated by authorities having jurisdiction.
   2. Level of Finish for Gypsum Board Assemblies: In accordance with ASTM C840, provide the Level of Finish for all gypsum board assemblies indicated in Paragraph 3.6.A.5 of this Section.
   3. Fire-Test-Response Characteristics of Gypsum Board Assemblies: For gypsum board assemblies with fire-resistance-ratings, provide materials and construction identical to those tested in assemblies by an independent testing and inspecting agency acceptable to authorities having jurisdiction at the Site, and in compliance with ASTM E119.
      a. Fire-Resistance-Rating: As shown or indicated on the Contract Documents, conforming to UL Fire Resistance Directory.

2.2 MANUFACTURERS

A. Gypsum Board Products, Accessories and Trim: Provide products as manufactured by one of the following:
   1. Gold Bond Building Products, by National Gypsum Company.
   2. ToughRock Products, by G-P Gypsum Corporation.
   3. SHEETROCK Brand Products, by United States Gypsum Company, Subsidiary of USG Corporation.
   4. Or equal.

B. Metal Support System Components: Refer to Section 09 22 16, Non-Structural Metal Framing.

2.3 INTERIOR GYPSUM BOARD

A. Exposed Gypsum Board: Provide the following types of interior gypsum board with two edge configurations where available from manufacturers specified; with 100 percent recycled paper on front, back, and long edges bonded to the core; complying with ASTM C1396:
   1. Panel Size: Provide all panels in maximum lengths and widths available that minimize joints in each area and correspond with spacing of support system components.
   2. Surface Burning Characteristics, ASTM E84: Flame Spread: 15, Smoke Development: Zero.
   3. Moisture and Mold-Resistant Gypsum Board: Gypsum core wall panel with additives to enhance the mold and water resistance of the core; surfaced with moisture/mold resistant paper on front, back and long edges; ASTM C1396 (Section 5).
      a. Mold and Mildew Resistance: Panel score of 10, when tested in accordance with ASTM D3273.
   4. Thickness: 5/8-inch, except 1/2-inches for regular gypsum board and 1/4-inch for double layer installations and flexible gypsum board.
   5. Long-Edge Profile: Tapered.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475.

B. High-Strength Joint Reinforcing Tape for Exterior and Interior Applications: Fiberglass, self-adhering, two inches wide, in compliance with ASTM D578, ASTM D5034, and ASTM D5035.

C. Joint Compound for Exterior and Interior Applications: Provide dry-powder, sandable, self-setting chemical hardening compounds for all gypsum board assemblies Work, recommended by manufacturer as being unaffected by humidity after hardening and drying.
   1. For each coat use formulation compatible with other compounds applied previously, and compatible with successive coats.
   2. Provide special chemical-hardening-type, slow-setting, or regular-setting-type compounds for gypsum board assemblies.
      a. Prefilling: At open joints, rounded panel edges, and damaged surface areas, use setting-type taping compound.
      b. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges use setting-type taping compound.
      c. Fill Coat: For second coat, use setting-type, sandable topping compound.
      d. Finish Coat: For third coat, use setting-type, sandable topping compound.

e. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:
1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
2. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
3. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.5 TRIM ACCESSORIES

A. General: Comply with ASTM C1047.

B. Products: Provide manufacturer's standard trim accessories of types shown or indicated for gypsum board assemblies, formed of hot-dipped galvanized steel or zinc, with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, J-type wallboard casings and one-piece control joint beads.
1. Finishing Type: Manufacturer's standard trim units to be finished with joint compound.

2.6 GYPSUM BOARD FASTENERS

A. Gypsum Board Fasteners: Comply with GA-216, and with gypsum board manufacturer's recommendations; choice is installer's option where more than one type is recommended for application specified.
1. Steel Drill Screws: Self-drilling, self-tapping, bugle-head complying with ASTM C954 and ASTM C1002, for use with power-driven tools.
a. Type S for wallboard to sheet metal.

2.7 AUXILIARY MATERIALS

A. Isolation Strips: Adhesive-backed, closed-cell, vinyl foam strips that allow fastener penetration without foam displacement, 1/8-inch thick in width to suit stud size.

B. Thermal Insulation: Refer to Section 07 21 05, Building Insulation.

C. Vapor Barrier: Refer to Section 07 21 05, Building Insulation.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine substrates and spaces to receive gypsum board assemblies, and conditions under which gypsum board assemblies will be installed, and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Verify that spacing of installed, non-load-bearing steel framing does not exceed maximum allowable for types of gypsum board assemblies approved for the Work.

B. Verify that doorframes are set for thicknesses of gypsum board shown on approved Shop Drawings and in the Contract Documents.

C. Repair protrusions of framing, twisted framing members, and unaligned members before commencing gypsum board installation.

D. Protect adjacent surfaces against damage and stains.

3.3 INSTALLATION OF METAL SUPPORT SYSTEMS

A. Refer to Section 09 22 16, Non-Structural Metal Framing.

3.4 INSTALLATION OF GYPSUM BOARD

A. General:
   1. Standards: Comply with ASTM C840. Comply with requirements for fire resistance-ratings and STC-ratings shown.
   2. Provide sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
   3. Provide ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
   4. Provide gypsum panels with face side out. Butt panels together for light contact at edges and ends with not more than 1/16-inch of open space between panels. Do not force into place.
   5. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Do not make joint other than control joints at corners or framed openings.
   6. Attach gypsum board to steel studs and blocking so leading edge or end of panel is attached to open (unsupported) edges of stud flanges first.

7. Attach gypsum panels to framing provided at openings and cutouts.
8. Cut back paper; do not tear or snap.
9. Control Joints: Form control joints and expansion joints with 1/2-inch continuous opening between edges of adjacent boards for insertion of control joint trim accessory. Provide control joints as shown; if not otherwise shown or indicated, provide at the following locations:
    a. Ceilings:
        1) Areas exceeding 2,500 square feet.
        2) Not more than 50 feet on centers.
        3) Where ceiling framing or furring changes direction.
        4) In furred assemblies where control joints occur in structural ceiling.
        5) Where expansion joints occur in steel framing.
    b. Do not locate joints within eight inches of corners or openings, except where control joints are shown at jamb lines or where openings occur adjacent to corners in partition/wall layout. Where necessary, provide a single vertical joint over center of wide openings.
10. Provide perimeter isolation where non-load-bearing partitions abut structural decks or ceilings, or vertical structural elements. Allow not less than 1/4-inch, or more than 1/2-inch gap between gypsum and structure. Finish edges of face layer with J-Type (semi-finishing) casing bead. Seal space between casing bead and structure with continuous acoustical sealant bead. Attach gypsum board to studs not less than 1/2-inch below bottom edge of ceiling track flanges and to first stud adjacent to vertical tracks. Do not attach board directly to tracks.
11. Floating Construction: Where feasible, and recommended by manufacturer, provide gypsum board with “floating” internal corner construction, unless isolation of intersecting boards or control or expansion joints are shown.

B. Space fasteners in gypsum panels according to manufacturer’s written recommendations and reference standards used in this Section.
    1. Space screws maximum of 12 inches on centers for vertical applications.
    2. Space fasteners in panels that are ceramic tile substrates a maximum of eight inches on centers.

C. Panel Installation Methods:
    1. General: In addition to complying with reference standards used in this Section, comply with specific requirements indicated for each type or arrangement of gypsum board assembly shown.
    2. Single-Layer Applications:
        a. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible, and at right angles to framing, unless otherwise shown or indicated.
        b. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise shown or required by fire-resistance-rated assembly, and minimize end joints.
            1) Stagger abutting end joints not less than one framing member in alternative courses of board.

2) At stairwells and other high walls, provide panels horizontally (perpendicular to framing), unless otherwise shown or required by fire-resistance-rated assembly.

c. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate end joints over furring members.

d. For parallel applications, locate edge joints over supports; for right angle applications, stagger end joints over supports.

e. Apply gypsum panels to supports with steel drill screws.

D. Allowable Tolerances:

1. Gypsum Board Faces: 1/16-inch offsets between planes of board faces, and 1/8-inch in eight feet for plumb, level, warp, and bow.

2. Suspended Ceilings: Level main carrying channels to 1/8-inch in 12 feet measured lengthwise on each member and transversely between parallel members.

3.5 INSTALLATION OF TRIM ACCESSORIES

A. General: Provide trim accessories in accordance with ASTM C840. Coordinate, and integrate where possible installation of trim accessories with installation of gypsum board. Use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports. Otherwise, fasten flanges by nailing in accordance with manufacturer's written instructions.

B. Install metal corner beads at external corners of gypsum board assemblies.

C. Install metal edge trim where edge of gypsum board would otherwise be exposed or semi-exposed.

1. Provide J-Type semi-finishing trim, not for joint compound, at the following locations and where shown:

a. Edges of exterior gypsum board not covered by applied moldings.

b. On interior wall panels of exterior walls at juncture with ceilings.

c. At sealant-filled isolation joints and sound control joints, where gypsum drywall work abuts other construction including walls and ceilings.

d. At sealant-filled or gasket-filled building expansion joints, install back-to-back units spaced as shown or, if not shown, at 1/4-inch spacing.

D. Install control joint bead units where control joints are shown.

E. Miter corners of exposed molding and trim (semi-finishing) units. Align joints and support to eliminate offsets.

3.6 FINISHING OF GYPSUM BOARD ASSEMBLIES

A. General:
   1. Comply with GA-214 and finishing materials manufacturer's written instructions for mixing, handling, and applying materials. Machine- or hand-application is installer's option.
   2. Apply treatment at joints in both directions, flanges of trim accessories, but not semi-finishing types, gypsum board penetrations, electrical boxes, piping and similar work, fastener heads, surface defects, and elsewhere as shown or specified. Apply in manner that will result in each of these being concealed when applied decoration has been completed.
   3. Where open joints of more than 1/16-inch occur, including edges of boards with rounded or beveled corners, prefill joint with chemical-hardening-type bedding compound, prior to bedding of joint tape.
   4. Apply joint tape at joints between gypsum boards, except where trim accessory is shown.
   5. Level of Finish for Gypsum Board: As established by ASTM C840, provide the following Level of Finish for all gypsum board assemblies:
      a. Level 4: All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over flat joints and one separate coat of joint compound applied over interior angles. Cover fastener heads and accessories with three separate coats of joint compound. Joint compounds shall be smooth and free of tool marks and ridges. Coat all prepared surfaces with drywall primer prior to applying final finish. Coordinate with Section 09 91 00, Painting. Provide for the following areas:
         1) All.

3.7 FIELD QUALITY CONTROL

A. Before installing gypsum board ceilings, inspect ceiling support framing accompanied by ENGINEER and submit written report of deficiencies. Do not proceed with installing gypsum board on ceiling support framing until deficiencies are corrected.
   1. Notify ENGINEER fourteen days in advance of the date and time when Work, or part of Work, will be ready for above ceiling observation.
   2. Before notifying ENGINEER, complete the following in areas to receive gypsum board ceilings:
      a. Installation of 80 percent of lighting fixtures, powered for operation.
      b. Installation of insulation, and successful testing of piping conveying fluids.
      c. Installation of ventilation duct system.
      d. Installation of air distribution devices.
      e. Installation of ceiling support framing.

B. Special Inspections: Coordinate with the Coordinating Special Inspector. Refer to Section 01 45 33.00, Code-Required Special Inspections and Procedures, for requirements.

3.8 ADJUSTING AND CLEANING

A. Nail Pop:
   1. Repair nail pop by driving new nails approximately 1.5 inches from popped nail and reseat nail.
   2. When face paper is punctured, drive new nail or screw approximately 1.5 inches from defective fastening and remove defective fastening.
   3. Fill damaged surface with self-setting joint filler compound.

B. Ridging:
   1. Do not repair ridging until condition has fully developed, approximately six months after installation or one heating season.
   2. Sand ridges to reinforcing tape without cutting through tape.
   3. Fill concave areas on both sides of ridge with topping compound.
   4. After fill is dry, blend in topping compound over repaired area. Fill cracks with compound and finish smooth and flush.
   5. Installer shall advise CONTRACTOR, who shall advise ENGINEER, of required procedures for protecting completed gypsum board assemblies from damage and deterioration during remainder of construction. CONTRACTOR shall provide required protection.

+ + END OF SECTION + +

SECTION 09 61 53

CONCRETE HARDENER

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all concrete hardener Work.
   2. The extent of the concrete hardener includes all interior concrete floors not shown or scheduled to be finished with another material.
   3. The types of concrete hardener Work required include, but are not necessarily limited to, silicate penetrant.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the concrete hardener Work.

C. Related Sections:
   1. Section 03 00 05, Concrete.

1.2 QUALITY ASSURANCE

A. Installer's Qualifications: Engage a single installer regularly engaged in the installation of concrete hardeners with five years experience in the application of the types of materials required, and who agrees to employ only tradesmen with specific skills and experience in this type of Work. Installer shall meet the requirements of the concrete hardener manufacturer for providing guarantee coverage. Submit name and qualifications to ENGINEER.

B. Source Quality Control: Obtain all material from only one manufacturer who will send a qualified technical representative to the Site for the purpose of advising the installer of proper procedures and precautions for the use of the material, at no additional cost to the OWNER.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Copies of manufacturer’s specifications, recommendations and installation instructions. Include manufacturer’s published data, indicating the material complies with the requirements and is intended for the application shown.

b. Submit installer's qualifications in accordance with Article 1.2, above.

B. Informational Submittals: Submit the following:
   1. Certificates: Submit a certificate of coverage signed by a duly authorized representative of the manufacturer.

C. Closeout Submittals: Submit the following:
   1. Maintenance Data: Upon completion of the Work, furnish five copies of detailed maintenance manual including the following information:
      a. Product name and number.
      b. Name, address and telephone number of manufacturer and local distributor.
      c. Detailed procedures for routine maintenance and cleaning.
      d. Detailed procedure for light repair such as scratches and staining.

   2. Guarantee Documentation:
      a. Submit for approval written guarantee agreeing to replace the concrete hardener should it fail to perform as specified in Article 1.6, below.

1.4 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded, in ample time to prevent delay of that Work.
   2. Deliver materials in concrete hardener manufacturer’s original unopened containers.
   3. Include the following information on the label:
      a. Name of material and supplier.
      b. Formula or specification number, lot number and date of manufacturer.
      c. Mixing instructions, shelf life and curing time when applicable.
   4. Failure to comply with these requirements shall be sufficient cause for the rejection of the material in question, by ENGINEER, and requiring its removal from the Site. In such a case, supply new material conforming to the specified requirements, at no additional cost to OWNER.
   5. Handle materials carefully to prevent inclusion of foreign materials.
   6. Do not open containers or mix components until all necessary preparatory Work has been completed.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Store materials so as to preclude the inclusion of foreign material.
   3. Protect material from freezing.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.5 JOB CONDITIONS

A. Environmental Conditions:
   1. Do not apply concrete hardener to uncured concrete. Comply with manufacturer's written instructions for minimum ten days of curing time.
   2. Apply hardener only when temperature of concrete is 50°F or above.

B. Protection:
   1. Do not allow concrete hardener to overflow or spill onto adjoining surfaces.
   2. Remove concrete hardener that is splashed on surfaces not designated to receive concrete hardener immediately by flushing with water.

C. Sequencing:
   1. Coordinate the Work so that the concrete hardener is installed when best results will be obtained, as recommended by the manufacturer's technical representative.

1.6 GUARANTEE

A. Provide a five year written guarantee, signed by CONTRACTOR and installer, stating that should concrete floors show signs of dusting because of wear and abrasion they will be re-installed, in the manner specified herein, at no additional cost to OWNER, from the date of Final Acceptance of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Hardener: Provide a clear, colorless, aqueous solution of chemically active, magnesium, silicates and fluosilicates plus a wetting and penetrating agent, that reacts with the free lime and calcium carbonates to bind soft, loose particles together and form a hard dense vitreous surface which is resistant to chemical attack and the growth of mildew, fungi and other organisms. Use potable water only.

2.2 MANUFACTURERS

A. Products and Manufacturers: Provide one of the following:
   1. MasterKure HD 300WB by Master Builders Solutions Construction Systems US, LLC.
   2. Armortop by Anti-Hydro Waterproofing Company.
   3. Or equal.

2.3 MIXES

A. Follow manufacturer's written instructions for the proper mixing, dilution and coverage of each coat.

2.4 FINISH

A. The finished installation of the concrete hardener shall have a smooth, uniform even finish without discontinuities or discolorations.

PART 3 - EXECUTION

3.1 INSPECTION

A. CONTRACTOR shall examine the substrates and the conditions under which the concrete hardener Work is to be performed and notify ENGINEER, in writing, of any conditions detrimental to the proper and timely completion of the Work and performance of the concrete hardener. Do not proceed with the concrete hardener Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 SUBSTRATE PREPARATION

A. Steel trowel concrete in strict accordance with printed directions supplied by the concrete hardener manufacturer.

B. Provide concrete free of all honeycombing and fins.

C. Do not use sealers, curing or parting compounds on the concrete.

D. Provide wet curing only.

E. Surfaces to receive concrete hardener shall be clean, dry and free of all loose dirt, oil, wax and other foreign matter.

3.3 INSTALLATION

A. Provide the services of a manufacturer's technical representative for the purpose of advising the installer of proper procedures and precautions for the use of the material prior and during the installation of the concrete hardener.

B. Apply concrete hardener using the coverage recommended by the manufacturer per coat.

C. Apply a minimum of three separate coats.

D. Apply a fourth coat using undiluted material should the manufacturer's technical representative recommend this procedure, based on field conditions, and as directed by ENGINEER.

E. Apply each coat by spray.

F. Mop up excess solution or puddles.

G. After each of the first and second applications, allow the floor to dry until no longer visibly wet.

H. To avoid the development of crystals, when applying the third coat, flush the surface liberally with clean, hot water. At the same time, brush the floor rapidly with a stiff-bristle broom. Mop up excess water.

I. Follow manufacturer's written instructions should white crystals develop after the first or second coat. Consult manufacturer's technical representative.

3.4 ADJUSTMENT AND CLEANING

A. Clean adjacent surfaces of concrete hardener resulting from the Work. Use solvent or cleaning agent recommended by the concrete hardener manufacturer. Leave all finished Work in a clean neat appearance.

B. Protect the concrete hardener until fully cured.

+ + END OF SECTION + +

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SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and apply paint systems.
      a. CONTRACTOR is responsible for surface preparation and painting of all new and existing interior and exterior items and surfaces throughout the Project areas included under this and other Sections.
   2. Extent of painting includes the Work specified below. Painting shown in schedules may not provide CONTRACTOR with complete indication of all painting Work. Refer to Article 2.2 of this Section where all surfaces of generic types specified are specified for preparation and painting according to their status, intended function, and location, using the painting system for that surface, function, and location as specified, unless specifically identified on the Drawings as a surface not to receive specified painting system.
      a. All new and specifically identified existing surfaces and items except where the natural finish of the material is specified as a corrosion-resistant material not requiring paint; or is specifically indicated in the Contract Documents as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint them the same as adjacent similar materials or areas.
      b. Mechanical and process items to be painted include:
         1) Piping, pipe insulation, pipe hangers, and supports, including electrical conduit.
         2) Heat exchangers.
         3) Tanks.
         4) Ductwork and insulation.
         5) Motors, mechanical equipment, and supports.
         6) Accessory items.
      c. Surface preparation and painting of all new and specifically identified existing items, both interior and exterior, and other surfaces, including items furnished by OWNER, are included in the Work, except as otherwise shown or specified.
      d. Removal of all substances, top coats, primers and all intermediate coats of paint and other protective or decorative coatings on those items and surfaces to remain that are identified to receive a painting system under this Section, to provide surfaces acceptable for application of painting specified.
      e. Approved stepped-down mock-ups for all painting systems showing all components of the surface preparation and paint system application before start of Work. Check all dry film thicknesses; demonstrate methods of surface

preparation, and methods of application, and obtain ENGINEER's approval of colors and textures to be used in the Work.

B. Coordination:
   1. Review installation, removal, and demolition procedures under other Sections and coordinate them with the Work specified in this Section.
   2. Coordinate painting of areas that will become inaccessible once equipment, electrical cabinets, heaters, ductwork and similar fixed items have been installed.
   3. Coordinate primers with finish paint materials to provide primers that are compatible with finish paint materials. Review other Sections where primed surfaces are provided, to ensure compatibility of total painting system for each surface. CONTRACTOR is responsible for coordinating compatibility of all shop primed and field painted items in other Sections.
   4. Furnish information to ENGINEER on characteristics of finish materials proposed for use and ensure compatibility with prime coats used. Provide barrier coats over incompatible primers or remove and repaint as required. Notify ENGINEER in writing of anticipated problems using specified painting systems with surfaces primed by others. Reprime equipment primed in factory and other factory-primed items that are damaged or scratched.

C. Related Sections:
   1. Section 02 83 19, Lead-Based Paint Remediation.
   2. Section 07 92 00, Joint Sealants.

D. Work Not Included: The following Work is not included as painting Work, or are included under other Sections:
   1. Shop Priming: Shop priming of structural metal, miscellaneous metal fabrications, other metal items and fabricated components such as shop-fabricated or factory-painted process equipment, plumbing equipment, heating and ventilating equipment, electrical equipment, and accessories shall conform to applicable requirements of this Section but are included under other Sections or in other contracts.
   2. Pre-finished Items:
      a. Items furnished with such finishes as baked-on enamel, porcelain, and polyvinylidene fluoride shall only be touched up at Site by CONTRACTOR using manufacturer's recommended compatible field-applied touchup paint.
      b. Items furnished with finishes such as chrome plating or anodizing.
   3. Concealed Surfaces: Non-metallic wall or ceiling surfaces in areas not exposed to view, and generally inaccessible areas, such as furred spaces, pipe chases, duct shafts, and elevator shafts.
   4. Concrete surfaces below elevation 19.00, unless otherwise shown or specified.
   5. Concrete floors, unless specifically shown as a surface to be painted.
   6. Face brick, glazed structural tile, and prefaced, ground-faced or split-faced concrete unit masonry.
   7. Exterior face of architectural precast concrete.

8. Collector bearings, shafts and chains, wood flights, wood stop logs, and wood or fiberglass baffles.
9. Corrosion-Resistant Metal Surfaces: Where the natural oxide of item forms a barrier to corrosion, whether factory- or Site-formed, including such materials as copper, bronze, muntz metal, terne metal, and stainless steel.
10. Operating Parts and Labels:
    a. Do not paint moving parts of operating units, mechanical and electrical parts such as valve and damper operators, linkages, sensing devices, interior of motors, and fan shafts.
    b. Do not paint over labels required by governing authorities having jurisdiction at Site, or equipment identification, performance rating, nameplates, and nomenclature plates.
    c. Cover moving parts and labels during the painting with protective masking. Remove all protective masking upon completion of Work. Remove all paint, coatings, and splatter that comes in contact with such labels.
11. Structural and miscellaneous metals covered with concrete need not receive primers, intermediate, or finish coats of paint.

E. Description of Colors and Finishes:
1. Color Selection:
    a. A maximum of five different colors will be selected by ENGINEER in addition to color coding of pipelines, valves, equipment, ducts, and electrical conduit.
    b. ENGINEER reserves the right to select non-standard colors for paint systems specified within ability of paint manufacturer to produce such non-standard colors. Provide such colors at no additional expense to OWNER.
2. Color Coding of Pipelines, Valves, Equipment, and Ducts:
    a. In general, color-coding of pipelines, valves, equipment and ducts shall comply with applicable standards of ANSI A13.1, ANSI Z535.1 and 40 CFR 1910.144. Provide color-coding for pipelines per Table 09 91 00-B, Pipeline Color Table.
    b. For equipment on roofs or exposed to view, such as on exterior building facades and in offices and lobbies, color shall be selected by ENGINEER.
3. Color Coding of Pipelines and Equipment:
    a. Finish coats of paint for pipelines and equipment shall be coded in basic colors. Colors shall be brilliant, distinctive shades matching the following safety and pipeline colors per ANSI Z535.1, Recommended Standards for Water Works; Recommended Standards for Wastewater Facilities, color specifications for safety colors and other primary colors:

Color	**Designation***
Aqua	Aqua Sky: 10GN
Black	Black; 35GR
Blue	True/Safety Blue; 11SF
Brown	Terra Cotta; 07RD
Charcoal	Deep Space; 34GR

Dark Blue	Academy Blue; 35BL
Dark Brown	Medium Bronze; 85BR
Dark Gray	Slate Gray; 31GR
Gray	Gray-ANSI 61; 33GR
Green	Spearmint/Safety Green; 09SF
Light Blue	Fontain Bleau; 25BL
Light Brown	Twine; 68BR
Light Gray	Light Gray; 32GR
Light Green	Margarita; 38 GN
Olive	Clover; 110GN
Orange	Tangerine/Safety Orange; 04SF
Red	Candy Apple/Safety Red; 06SF
White	White; 11WH
Yellow	Lemon/Safety Yellow; 02SF

*Color designations are provided per Tnemec Company, Inc. paint color numbers and are provided as a standard of quality; equivalent colors matching these colors are acceptable. Provide with Shop Drawing submittal direct color comparisons of color numbers available from manufacturer submitted.

b. General Color Code: Unless otherwise specified, use the following color code:

TABLE 09 91 00-B
PIPELINE COLOR TABLE

Pipeline	**Color**
WATER	
City Water	Blue
Cold Water	Blue
Non-Potable Water	Blue/Black Bands
FUELS AND LUBRICANTS	
Diesel Fuel Oil	Yellow
PROCESS	
Floor Drains	Gray
Sewage	Dark Gray
Sump Drains	Gray

c. Color of final coats shall match as closely as possible, without custom blending, color tabulated for specific pipeline service.

4. After approval by ENGINEER of colors and Shop Drawings and prior to commencing painting Work, ENGINEER will furnish color schedules for surfaces to be painted.

F. Abbreviations and Symbols:

1. Abbreviations and symbols used in painting systems are explained in Article 2.2 of this Section and provide information on generic composition of required materials,

manufacturers, number of coats and dry mil film thickness per coat (DMFTPC), and coverage for determining required number of gallons for the Work.

1.2 REFERENCES

A. Referenced Standards: Standards referenced in this Section are:
   1. ANSI A13.1, Scheme for Identification of Piping Systems.
   2. ANSI Z535.1, Safety Color Code.
   3. ANSI/NSF Standard 60, Drinking Water Treatment Chemicals - Health Effects.
   4. ANSI/NSF Standard 61, Drinking Water System Components – Health Effects.
   5. ASTM D16, Terminology for Paint, Related Coatings, Materials and Applications.
   6. ASTM D2200, Pictoral Surface Preparation Standards for Painting Steel Surfaces.
   7. ASTM D4258, Practice for Surface Cleaning Concrete for Coating.
   8. ASTM D4259, Practice for Abrading Concrete.
   9. ASTM D4262, Testing Method for pH of Chemically Cleaned or Etched Concrete Surfaces.
   10. ASTM D4263, Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
   11. ASTM D4285, Test Method for Indicating Oil or Water in Compressed Air.
   12. ASTM D4417, Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.
   13. ASTM D4541, Test Methods for Pull-Off Strength of Coatings Using Portable Adhesion-Testers.
   14. ASTM E329, Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
   15. AWWA C652, Disinfection of Water-Storage Facilities.
   16. AWWA D102, Coating Steel Water-Storage Tanks.
   17. California Air Resources Board (CARB) Revised Suggested Control Measure (SCM)
   18. 29 CFR 1910.144, Safety Color Code for Marking Physical Hazards.
   19. 40 CFR, Subpart D-2001, National Volatile Organic Compound Emission Standards for Architectural Coatings.
   20. South Coast Air Quality Management District (SCAQMD) Rule 1113,
   21. Green Seal, Inc. Paint, (GS-11).
   22. Maricopa County, Arizona Architectural Coatings Rule 335.
   23. National Association of Piping Fabricators, NAPF 500-03, Surface Preparation Standard For Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings And/or Special Internal Linings.
   24. Ozone Transport Commission, (OTC), OTC Model Rule for Architectural and Industrial Maintenance Coatings.
   25. Resource Conservation and Recovery Act of 1976 (RCRA).
   26. SSPC PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
   27. SSPC SP 1, Solvent Cleaning.
   28. SSPC SP 3, Power Tool Cleaning.
   29. SSPC SP 6, Commercial Blast Cleaning.
   30. SSPC SP 10, Near-White Blast Cleaning.

31. SSPC SP 11, Power Tool Cleaning To Bare Metal.
32. SSPC VIS 1, Visual Standard for Abrasive Blast Cleaned Steel.
33. SSPC VIS 2, Method of Evaluating Degree of Rusting/Painted Steel Surfaces.
34. SSPC Volume 2, Systems and Specifications.

1.3 DEFINITIONS

A. Standard coating terms defined in ASTM D16 apply to this Section, including:
   1. Paint: Pretreatment and all painting system materials, such as primer, emulsion, enamel, organic/inorganic polymer coating, stain sealer and filler, and other applied materials whether used as prime, filler, intermediate, or finish coats.
   2. Exposed: All items not covered with cement plaster, concrete, or fireproofing. Items covered with these materials shall be provided with specified primer only, except where specified as a surface not to be painted. Exposed-to-view surfaces include areas visible after permanent or built-in fixtures, convector covers, ceiling tile, covers for finned tube radiation, grilles, and similar covering products are in areas scheduled to be painted.
   3. LEED Compliant: As defined by the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED), means interior field-applied coatings that shall have a maximum volatile organic compound (VOC) and chemical content as listed in Green Seal, Inc. Paints (GS-11).
   4. Low VOC: All interior and exterior field-applied coatings that have maximum VOC content as listed in OTC Model Rule for Architectural and Industrial Maintenance Coatings.
   5. OTC: Ozone Transport Commission, which recommends standard VOC content levels in several Northeastern and Mid-Atlantic states.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications:
   1. Engage a single applicator that regularly performs installation of paint materials, with documented skill and successful experience in installing types of products required and that agrees to employ only trained, skilled tradesmen who have successful experience in installing types of products specified.
   2. Submit name and qualifications to ENGINEER along with following information for at least three successful, completed projects:
      a. Names and telephone numbers of owner and design professional responsible for project.
      b. Approximate contract cost of paint products.
      c. Amount of area painted.
   3. Submit to ENGINEER proof of acceptability of applicator by manufacturer.

B. Testing Agency Qualifications: Provide an independent testing agency for testing specified in this Section. Testing agency shall be selected by OWNER and paid for by CONTRACTOR. When requested, submit documentation demonstrating to satisfaction

of ENGINEER, that testing agency has experience and capability to satisfactorily conduct testing required without delaying the Work, in accordance with ASTM E329.

C. Source Quality Control:
   1. Obtain materials from manufacturers that will provide services of a qualified manufacturer's representative at Site at commencement of painting Work, to advise on products, mock-ups, installation, and finishing techniques and, at completion of Work, to advise ENGINEER on acceptability of completed Work and during the course of the Work as may be requested by ENGINEER.
   2. Certify long-term compatibility of all coatings with surfaces.
   3. Do not submit products that decrease number of coats, surface preparation, or generic type and formulation of coatings specified. Products exceeding VOC limits and chemical content specified will not be approved.
   4. ENGINEER may review manufacturers' recommendations concerning methods of installation and number of coats of paint for each painting system. CONTRACTOR shall prepare construction costs based on painting systems, number of coats, coverage's and installation methods specified.
   5. Submit "or equal" products, when proposed, with direct comparison to products specified, including information on durability, adhesion, color and gloss retention, percent solids, VOC's grams per liter, and recoatability after curing.
   6. "Or equal" manufacturers shall furnish same color selection as manufacturers specified, including intense chroma and custom pigmented colors in all painting systems.
   7. Color Pigments: Provide pure, non-fading, applicable types to suit surfaces and services to be painted. Comply with:
      a. Lead and Chromate: Lead and chromate content shall not exceed amount permitted by authorities having jurisdiction.
      b. Areas subject to hydrogen sulfide fume exposure will be identified by ENGINEER. Through CONTRACTOR, paint manufacturer shall notify ENGINEER of colors that are not suitable for long-term color retention in such areas.
      c. Manufacturer shall identify colors that meet the requirements of authorities having jurisdiction at Site for use in locations subject to contact with potable water or water being prepared for use as potable water.
      d. Comply with paint manufacturer's recommendations on preventing coating contact with levels of carbon dioxide and carbon monoxide that may cause yellowing during application and initial stages of curing of paint.
   8. Obtain each product from one manufacturer. Multiple manufacturing sources for the same system component are unacceptable.
   9. Certify product shelf life history for each product source for materials manufactured by the same manufacturer, but purchased and stored at different locations or obtained from different sources.
   10. Constantly store materials to be used for painting Work between 60 degrees F and 90 degrees F, and per paint manufacturer's written recommendations, for not more than six months. Certify to ENGINEER that painting materials have been

manufactured within six months of installation and have not, nor will be, subjected to freezing temperatures.

D. Regulatory Requirements:
   1. Comply with VOC content limits of OTC Model Rule for Architectural and Industrial Maintenance Coatings:
      a. Industrial Maintenance Coatings: 340 grams per liter.
      b. Interior and Exterior Non-Flat Coatings: 150 grams per liter.
   2. Comply with the following:
      a. 29 CFR 1910.144, Safety Color Code for Marking Physical Hazards.
      b. 40 CFR, Subpart D-2001, National Volatile Organic Compound Emission Standards for Architectural Coatings.
      c. Resource Conservation and Recovery Act of 1976 (RCRA).
      d. SW-846, Toxic Characteristic Leaching Procedure (TCLP).
   3. Comply with authorities having jurisdiction at Site for blast cleaning, confined space entry, and disposition of spent abrasive and debris.

E. Mock-ups:
   1. Demonstrate installation of specified painting systems on actual wall surfaces and building components at locations selected by ENGINEER.
   2. Provide 4-foot by 8-foot stepped-down sample area for each painting system. Prior to application of painting system, but after ENGINEER's approval of the components of each painting system, apply a 4-foot wide sample of each operation and application step required by this Section and specified manufacturer's written application recommendations. Show each application step as a 2-foot long section that shall remain exposed to demonstrate work performed in that step. Continue application procedures until topcoat is provided. Topcoat shall be a minimum of two feet long. When completed, finished mock-up for each paint system shall reveal each step and each coat of paint required for paint system with 2-foot wide strips revealing Work performed to prepare surface and apply each coat. Lengthen overall mock-up as required to completely demonstrate each painting system. Use tinted shades differing from coat to coat for each component of each painting system.
   3. ENGINEER may approve or disapprove each component of each painting system on an individual component basis.
   4. Painting Work that does not meet standard approved on sample areas shall be removed and replaced.
   5. Painting Work advanced without approved mock-ups shall stop, and mock-ups prepared for approval by ENGINEER.

F. Pre-painting Conference:
   1. Prior to installing painting systems, arrange a meeting at Site with painting applicator and its foreman, paint manufacturer's technical representative, installers of other work in and around painting that must follow painting Work, ENGINEER, and other representatives directly concerned with performance of painting Work. Record discussions of conference and decisions and agreements and disagreements

and furnish a copy of record to each party attending. Review foreseeable methods and procedures relating to painting Work including:

a. Review Project requirements including Contract Documents, approved Shop Drawings, pending and approved Change Orders, requests for information that submitted by CONTRACTOR to ENGINEER, and other pertinent documents.
b. Review required samples and submittals, both completed and to be completed.
c. Review status of surfaces including drying, surface preparations, and similar considerations.
d. Review availability of materials, tradesmen, equipment, and facilities required for progress, to avoid delays, and to protect Work from damage.
e. Review required inspection, testing, certifying, and quality control procedures.
f. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions. Supplemental heating sources required to for working in low-temperature conditions, shall be operating and acceptable to paint applicator and ENGINEER.
g. Review methods for complying with regulations of authorities having jurisdiction at Site, such as compliance with environmental protection, health, safety, fire, and similar regulations.
h. Review laws and procedures covering removal and disposal of blast debris.

2. Reconvene meeting at earliest opportunity if additional information must be developed to conclude the required topics of the meeting.
3. Record revisions or changes agreed upon, reasons therefore, and parties agreeing or disagreeing with them.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data:
      a. Copies of manufacturer's technical information and test performance data, including paint analysis, VOC and chemical component content in comparison to maximum allowed by the Contract Documents, and application instructions for each product proposed for use.
      b. Submit proof of acceptability of proposed application techniques by paint manufacturer selected.
      c. Copies of CONTRACTOR's proposed protection procedures in each area of the Work explaining methods of protecting adjacent surfaces from splatter, for confining application procedures in a manner that allows other work adjacent to surface preparation and painting Work to proceed safely and without interruption, and for maintaining acceptable application, curing, and environmental conditions during and after painting systems application.
      d. List each material and cross-reference to the specific painting system and application, including a list of site-specific surfaces to which painting system will be applied. Identify by manufacturer's catalog number and general classification. State number of gallons of each product being purchased for delivery to Site and square foot area calculated to be covered by each painting system specified based on theoretical loss of 20 percent. Where actual area to

be covered by paint system exceeds area submitted to ENGINEER for that system, proof of additional material purchase shall be provided to ENGINEER. Calculated coverage shall be as specified for each component of each painting system specified. This requirement does not take precedence over CONTRACTOR's responsibility to provide dry film thickness required for each component of each painting system.

e. Identify maximum exposure times allowable for each paint system component before next coat of paint can be applied. Submit proposed methods for preparing surfaces for subsequent coats if maximum exposure times are exceeded.

f. Information on curing times and environmental conditions that affect curing time of each paint system component and proposed methods for accommodating variations in curing time. Identify this information for each painting system in the Work.

g. Specification for spray equipment with cross-reference to paint manufacturer's recommended equipment requirements.

2. Samples:
   a. Copies of manufacturer's complete color charts for each coating system.
   b. Mock-ups specified for the Site.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Certificate from paint manufacturer stating that materials meet or exceed Contract Documents requirements.
      b. Evidence of shelf life history for all products verifying compliance with the requirements of the Contract Documents.
      c. CONTRACTOR shall provide notarized statement verifying that all painting systems are compatible with surfaces specified. All painting systems components shall be reviewed by an authorized technical representative of paint manufacturer for use as a compatible system. Verify that all painting systems are acceptable for exposures specified and that paint manufacturer is in agreement that selected systems are proper, compatible, and are not in conflict with paint manufacturer's recommended specifications. Show by copy of transmittal form that a copy of letter has been transmitted to paint applicator.
   2. Test Reports:
      a. Certified laboratory test reports for required performance and analysis testing in compliance with ASTM E329.
      b. Adhesion testing plan and procedures.
      c. Results of adhesion testing on existing surfaces containing paints or other coatings to be topcoated with paint systems specified. Prior to adhesion testing, submit a testing plan establishing methods, procedures and number of tests in each area where existing coatings are to remain and become substrate for painting Work. Based on results of adhesion testing, recommend methods, procedures, and painting system modifications, if necessary, for proceeding with Work.

d. Locations of and test methods for soil sampling before beginning Work and after Substantial Completion.
e. Proposed methods for testing, handling, and disposal of waste generated during Work.
f. Results of alkalinity and moisture content tests performed in accordance with ASTM D4262 and ASTM D4263.
g. Results of tests of film thickness, holidays, and imperfections.

3. Manufacturer's Instructions: Provide paint manufacturer's storage, handling, and application instructions prior to commencing painting Work at Site.
4. Manufacturer's Site Reports: Provide report of paint manufacturer's representative for each visit to Site by paint manufacturer's representative.
5. Special Procedure Submittals:
   a. Proposed protection procedures for each area of Work, explaining methods of protecting adjacent surfaces from splatter, for confining application procedures in a manner that allows other work adjacent to surface preparation and painting Work to proceed safely and without interruption.
   b. Site-specific health and safety plan.
   c. Procedures for maintaining acceptable application, curing and environmental conditions during and after painting systems application.
   d. Procedures for providing adequate lighting, ventilation, and personal protection equipment relative to painting Work.
6. Qualifications:
   a. Applicator.
   b. Testing laboratory

C. Closeout Submittals: Submit the following:
   1. Operations and Maintenance Data: Upon completion of the painting Work, furnish ENGINEER five copies of detailed maintenance manual including the following information:
      a. Complete and updated product catalog of paint manufacturer's currently available products including complete technical information on each product. Identify product names and numbers of each product used in the painting Work.
      b. Name, address, e-mail address and telephone number of manufacturer, local distributor, applicator and technical representative.
      c. Detailed procedures for routine maintenance and cleaning.
      d. Detailed procedures for light repairs such as dents, scratches and staining.
   2. Record Documentation: Statement of Application: Upon completion of the painting Work, submit a notarized statement to ENGINEER signed by CONTRACTOR and painting applicator stating that Work complies with requirements of the Contract Documents and that application methods, equipment, and environmental conditions were proper and adequate for conditions of installation and use.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Product Delivery Requirements: Deliver products to Site in original, new, and unopened packages and containers, accurately and legibly and accurately labeled with the following:
   1. Container contents, including name and generic description of product.
   2. Manufacturer's stock number and date of manufacture.
   3. Manufacturer's name.
   4. Contents by volume, for major pigment and vehicle constituents.
   5. Grams per liter of volatile organic compounds.
   6. Thinning instructions, where recommended.
   7. Application instructions.
   8. Color name and number.

B. Product Storage Requirements:
   1. Store acceptable materials at Site.
   2. Store in an environmentally controlled location as recommended in paint manufacturer's written product information. Keep area clean and accessible. Prevent freezing of products.
   3. Store products that are not in actual use in tightly covered containers.
   4. Comply with health and fire regulations of authorities having jurisdiction at Site.

C. Product Handling Requirements:
   1. Handle products in a manner that minimizes the potential for contamination, or incorrect product catalyzation.
   2. Do not open containers or mix components until necessary preparatory work has been completed and approved by ENGINEER and painting Work will start immediately.
   3. Maintain containers used in storing, mixing, and applying paint in a clean condition, free of foreign materials and residue.

1.7 SITE CONDITIONS

A. Site Facilities:
   1. Supplemental heat sources, as required to maintain both ambient and surface temperatures within range recommended by paint manufacturer for paint system application, are not available at Site.
   2. Provision of supplemental heat energy sources, power, equipment, and operating, maintenance and temperature monitoring personnel is responsibility of CONTRACTOR.
   3. Do not use heat sources that emit carbon dioxide or carbon monoxide into areas being painted. Properly locate and vent such heat sources to exterior such that paint systems are unaffected by exhaust.

B. Existing Conditions:
   1. Existing surfaces to receive painting Work shall be surface-prepared to meet requirements of painting systems specified. Prior to commencing painting Work, perform adhesion tests on existing surfaces to be painted. Perform testing per ASTM D4541 or other method acceptable to ENGINEER. Number and location of tests shall be sufficient to determine condition of existing coatings and suitability of existing coatings to remain to provide acceptable substrate for new coatings. Submit testing plan prior to testing and provide ENGINEER a copy of adhesion test results.
   2. Provide abrasive blasting, scraping, or other abrading or surface film removal, or preparatory techniques accepted by ENGINEER.
   3. Before commencing painting in an area, surfaces to be painted and floors shall be cleaned of dust using commercial vacuum cleaning equipment equipped with high-efficiency particulate air (HEPA(filters and dust containment systems.

C. Environmental Requirements:
   1. Apply water-base paints when the temperature of surfaces to be painted and ambient air temperatures are between 55 degrees F and 90 degrees F, unless otherwise permitted by paint manufacturer's published instructions.
   2. Surfaces to be painted shall be at least 5 degrees F above dew point temperature and be dry to the touch. Apply paint only when temperature of surfaces to be painted, paint products, and ambient air temperatures are between 65 degrees F and 95 degrees F, unless otherwise permitted by paint manufacturer's published instructions.
   3. Apply paint system within shortest possible time consistent with manufacturer's recommended curing instructions for each coat. If chemical, salt, or other contamination contacts paint film between coats, remove contamination per SSPC SP 1 and restore surface before applying paint.
   4. Do not paint tanks or pipelines containing fluid without specific permission of ENGINEER and only under conditions where "sweating" of outside surface of vessel being painted is not likely to occur within 24 hours of paint application.
   5. Do not apply epoxy paints if ambient temperature is expected to go below 50 degrees F within twelve hours of application. Follow manufacturer's instructions when manufacturer's published recommendations require a higher minimum ambient temperature.
   6. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent. Do not apply paint to damp or wet surfaces or when surfaces will reach dew point due to falling or rising temperatures and humidity conditions during course of paint application, unless otherwise permitted by paint manufacturer's published instructions.
   7. Do not paint unacceptably hot or cold surfaces until such surfaces can be maintained within temperature and dew point ranges acceptable to paint manufacturer. Arrange for surfaces to be brought within acceptable temperature and dew point ranges as part of painting Work.
   8. Moisture content of surfaces shall be verified to ENGINEER as acceptable prior to commencement of painting using methods recommended by paint manufacturer.

9. Painting may be continued during inclement weather only if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer for application and drying.
10. Provide adequate illumination and ventilation where painting operations are in progress.

D. Protection:
1. Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently, or not to be painted.
2. During surface preparation and painting, facility shall remain in operation. Use procedures that prevent contamination of process or cause or require facility shutdown.
3. Coordinate and schedule surface preparation and painting to avoid exposing personnel to hazards associated with painting Work. Provide required personnel safety equipment per requirements of authorities having jurisdiction at Site.
4. Submit protection procedures to be employed. Do not begin surface preparation and painting Work until ENGINEER accepts protection techniques proposed by CONTRACTOR.
5. When working with flammable materials, provide fire extinguishers and post temporary signs warning against smoking and open flame.

PART 2 - PRODUCTS

2.1 PAINTING SYSTEM MANUFACTURERS

A. Products and Manufacturers: Where referenced under painting systems provide products manufactured by the following:
1. Tnemec Company, Inc. (TCI).
2. The Carboline Company, part of StonCor Group, an RMP Company (TCC).
3. Sherwin-Williams Company (SWC).
4. Benjamin Moore & Company (BMC).
5. Righter Group Inc. (RGI)
6. Duron Inc. (DI)

2.2 PAINTING SYSTEMS

Surface/ Exposure	Surf. Prep.	Primer/Surfacer System Type % Solids	(Coats) DFT (Mils) Max VOC g/l (EPA)	Intermediate System Type % Solids	(Coats) DFT (Mils) Max VOC g/l (EPA)	Finish System Type % Solids	(Coats) DFT (Mils) Max VOC g/l (EPA)
Concrete Unit Masonry							
TABLE 09 91 00-A							
Aggressive and Moderate Corrosion and Abrasion; High Gloss; Non-Submerged ; Interior	1.5.A.2. 3.2.A. 3.2.B.1. 3.2.B2. 3.2.B..8.	-Series 130 Envirofill (TCI) -Sanitile 500 TG (TCC) Acrylic 53%	(1) 10-14 71	Primer -Series L69 Epoxoline II (TCI) - Carboguard 890 VOC (TCC) Epoxy 66%	(1) 5-20 214	-Series L69 Epoxoline II (TCI) -Carboguard 890VOC (TCC) Epoxy 66%	(2) 6-8 H (2) 4-6 V 214
Ferrous Metals, Structural Steel, Exterior Surfaces of Valves and Piping							
TABLE 09 91 00-B							
Moderate VOC Content; Non-Submerged; Interior	1.5.A.2. 3.2.A. 3.2.C.1. 3.2.C.2.	-Series V69 Epoxoline II(TCI) -Carboguard 890 (TCC) Epoxy 67%	(1) 4-6 228	Field Primer & Touch Up -Series V69 Epoxoline II(TCI) -Carboguard 890 (TCC) Epoxy 69%	(1) 4-6 228	-Series V69 Epoxoline II (TCI) -Carboguard 890 (TCC) Epoxy 69%	(2) 3-6 H (2) 3-4 V 228

Ferrous Metals, Non-Ferrous Metals; Exterior Surfaces of Piping							
TABLE 09 91 00-C							
Submerged; Non-Submerged and Itermittenly Submerged, Including up to 4 feet above Liquid Surface; Interior and Exterior	1.5.A.2. 3.2.A. 3.2.C.1. 3.2.C2. 3.2.E.	-Series V69 Epoxoline II (TCI) -Carboguard 890 (TCC) Epoxy 67%	(1) 4-6 234	<u>Field Primer & Touch Up</u> -Series V69 Epoxoline II (TCI) -Carboguard 890 (TCC) Epoxy 69%	(1) 6-8 228	-Series V69 Epoxoline II (TCI) -Carboguard 890 (TCC) Epoxy 69%	(2) 6-8 2284

Ferrous Metals, Non-Ferrous Metals; Galvanized Metals, Including Water Storage Tanks							
TABLE 09 91 00-D							
Non-Submerged; Low VOC Content; Gloss; Exterior	1.5.A.2. 3.2.A. 3.2.C.1. 3.2.C2. 3.2.E.	<u>Galvanized and Non-Ferrous Metal Primer</u> -Series V69 Epoxoline II (TCI) -Carboguard 890 (TCC) Epoxy 67%	(1) 4-6 250	<u>Ferrous Metal Touch Up Low Temperature</u> - Series V69F Epoxoline II (TCI) -Carboguard 890 LT (TCC) Epoxy 69% <u>Ferrous Metal Touch Up Warm Temperature</u> - Series V69F Epoxoline II (TCI) -Carboguard 890 (TCC) Epoxy 69%	(1) 4-6 228 (1) 4-6 228	-Series 1075 Endura-Shield (TCI) -Carbothane 134 VOC (TCC) Polyureathane 70%	(2) 2-5 220

Gypsum Wallboard, Plaster, and Wood							
TABLE 09 91 00-E							
Low VOC Content; Exterior.	1.5.A.2. 3.2.A. 3.2.H.	-Series 151 Elasto-Grip (TCI) -Sanitile 120 HD (TCC) Waterborne Epoxy or Waterborne Acrylic 17%	(1) 1-2 170			-Series 114 HB Tneme-Tufcoat (TCI) -Sanitile 255 WB (TCC) Waterborne Acrylic Epoxy or Water-Based Epoxy Acrylic 42%	(2) 4-6 244

TABLE 09 91 00-F							
Aluminum in Contact With Dissimilar Materials; Low VOC Content; Interior and Exterior.	1.5.A.2. 3.2.A. 3.2.D.	-Series 22 Pota-Pox 100 (TCI) -Carboguard 954 HB (TCC) Epoxy 100%	(1) 12-16 10			-Series 22 Pota-Pox 100 (TCI) -Carboguard 954 HB (TCC) Epoxy 100%	(1) 12-16 10

2.3 CALKING AND SEALANTS

A. Refer to Section 07 92 00, Joint Sealants.

2.4 INSTRUMENTS

A. Instruments:
   1. Provide one new dry-film thickness gauge for checking film thickness, one holiday detector to detect holidays or holes in the coating, and one set of visual standards to check surface preparation. Calibrate dry film thickness gauge at Site using Bureau of Standards standard shim blocks.
   2. Products and Manufacturers: Provide the following:
      a. Film Thickness Testers: Model FM-III manufactured by Mikrotest, or equal.
      b. Holiday detector shall be Model M-1 as manufactured by Tinker & Rasor, or equal.
      c. Visual Standards: ASTM D2200, Swedish Standards, SSPC VIS 1.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which painting Work is to be performed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film capable of performing in accordance with claims made in paint manufacturer's product literature for surfaces and conditions encountered.

C. Do not paint over existing paint where there is no assurance that existing paint will provide an acceptable surface for long-term adherence and durability of painting systems specified or where paint manufacturer requires removal of all existing paint to recommend use of specified painting system.

3.2 SURFACE PREPARATION

A. General:
   1. Test for moisture content of surfaces before commencement of painting Work. Test for moisture in concrete in compliance with ASTM D4263. Report results to ENGINEER before commencing Work.
   2. Prepare existing surfaces to be painted as specified for new surfaces. Submit substitute methods of preparing existing surfaces, when proposed, with Shop Drawing submittal. ENGINEER's acceptance of substitute

surface preparation methods does not relieve CONTRACTOR of performance required under the Contract Documents. To provide surfaces acceptable for application of painting system specified:

a. Clean and roughen surfaces of existing paint and other decorative or protective toppings on surfaces to remain that are to receive a painting system under this Section.
b. Where existing surfaces to be painted have corrosion, peeling paint, or unacceptably adhering coatings, remove all topcoats, primers, and intermediate coats of paint, and other protective or decorative coatings.

3. Perform preparation and cleaning procedures as specified herein and in strict accordance with paint manufacturer's approved instructions for each surface and atmospheric condition.
4. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items already in place that do not require field painting, or provide effective surface-applied protection prior to surface preparation and painting.
5. Remove as necessary items that must be field-painted where adjacent surfaces cannot be completely protected from splatter or overspray. Following completion of painting of each space or area, the removed items shall be reinstalled by workers skilled in the trades involved.
6. Clean surfaces to be painted before applying painting system components. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning.
7. Prepare surfaces that were improperly shop-painted and abraded or rusted shop-painted surfaces as specified.

B. Cast-In-Place Concrete, Precast Concrete and Masonry Surfaces:

1. Prepare surfaces of concrete unit masonry to be painted by removing all efflorescence, chalk, dust, dirt, grease, oils, and other contamination using soap and water. Surfaces shall be clean and dry at time of paint system application.
2. Concrete unit masonry that cannot be adequately cleaned using soap and water shall be acid etched with a commercial solution of 15 percent muriatic acid.
3. Prepare and clean cast-in-place concrete and precast concrete surfaces per ASTM D4259 to provide a uniform and continuous anchor profile of approximately one mil. Provide mechanical abrading and abrasive blasting per ASTM D4259. Use 40 to 80-mesh abrasive and clean, dry, compressed air. Compressed air cleanliness shall be per ASTM D4285. Pressure at blasting nozzle shall not exceed 80 pounds per square inch. Do not concentrate blast on surface; instead, move at a fairly rapid rate to provide a surface free of laitants and contaminants. Provide post-surface preparation cleaning per ASTM D4258 to remove loose material. Surface preparation shall open all surface air holes by removing laitance shoulders surrounding air holes. Vacuum surfaces to remove dust and sand, and wash with potable water.
4. Where paint system is for chemical containment barrier protection, repair cracks and expansion joints in concrete and provide 2-inch radiused cove

base fillets at equipment pads and containment walls as part of complete chemical containment paint system Work. Use materials and techniques recommended by manufacturers of the paint and concrete repair products.

5. Remove from cast-in-place concrete fins, projections, and other surface irregularities that would protrude above level of finished intermediate fillers and surfacers. Remove by chipping and scarification by mechanical abrasion.
6. Using specified filler and surfacer, patch cast-in-place concrete and precast concrete surfaces as required to completely fill surface air holes and honeycombing. Level all protrusions, grind filler and surfacing compounds smooth, and level with adjacent surfaces.
7. Perform tests per ASTM D4262 and ASTM D4263 to verify alkalinity and moisture content of surfaces to be painted, and report findings to ENGINEER. If, in ENGINEER's opinion, surfaces are sufficiently alkaline to cause blistering and burning of paint, correct the condition before applying paint. Provide suitable testing materials for alkalinity and moisture tests. Do not paint surfaces where the moisture content exceeds eight percent.
8. Where a concrete unit masonry block filler is specified, spot patch holes and cracks with a putty knife using specified block filler. Apply to large surfaces by airless spray and backroll uniformly using a roller with a synthetic nap cover. Follow with a rubber squeegee to provide a smooth finish.

C. Ferrous Metals:
   1. Ferrous Metals Except Ductile and Cast Iron:
      a. Comply with paint manufacturer's recommendations for type and size of abrasive to provide a surface profile that meets manufacturer's painting system requirements for type, function, and location of surface. Verify that paint manufacturer-recommended profiles have been achieved on prepared surfaces. Report profiles to ENGINEER using Test Method C of ASTM D4417.
      b. Clean non-submerged ferrous surfaces including structural steel and miscellaneous metal to be shop-primed, of all oil, grease, dirt, mill scale, and other contamination by commercial blast cleaning complying with SSPC SP 6 at time of paint system application, using SSPC VIS 1 as a standard of comparison.
      c. Clean submerged ferrous surfaces including structural steel and miscellaneous metal to be shop-primed of all oil, grease, dirt, mill scale, and other contamination by near-white blasting complying with SSPC SP 10 at time of painting system application, using SSPC VIS 1 as a standard of comparison.
      d. Clean non-submerged, ferrous surfaces that have not been shop-coated of all oil, grease, dirt, loose mill scale, and other contamination by commercial blasting complying with SSPC SP 6 at the time of painting system application, using SSPC VIS 1 as a standard of comparison.
      e. Clean submerged ferrous surfaces that have not been shop-coated or that have been improperly shop-coated of all oil, grease, dirt, mill

scale, and other contamination by near-white blasting complying with SSPC SP 10 at time of painting system application, using SSPC VIS 1 as a standard of comparison.

f. Touch-up shop-applied prime coats that have damaged or have bare areas with primer recommended by paint manufacturer after commercial blasting complying with SSPC SP 6 at the time of painting system application, using SSPC VIS 1 as a standard of comparison, to provide a surface profile of not less than one mil.

g. Power tool-clean per SSPC SP 3 to remove welding splatter and slag.

h. Remove all rust and contamination on existing ferrous metals to sound surfaces by power tool-cleaning complying with SSPC SP 11 to provide a surface profile of not less than one mil.

2. Ductile and Cast Iron:

a. Comply with paint manufacturer's recommendations and NAPF 500-03 for type and size of abrasive to provide a surface profile meeting paint manufacturer's requirements for type, function and location of surface. Verify that paint manufacturer-recommended profiles are achieved on prepared surfaces.

b. Clean submerged and non-submerged ductile and cast iron surfaces to be shop-primed of all oil, grease, dirt, mill scale, and other contamination by solvent cleaning and abrasive blasting complying with NAPF 500-03-01, NAPF 500-03-04, and NAPF 500-03-05 at time of paint system application.

c. Clean submerged ductile and cast iron that have not been shop-coated or that have been improperly shop-coated of all oil, grease, dirt, mill scale, and other contamination by solvent cleaning and abrasive blasting complying with NAPF 500-03-01, NAPF 500-03-04, and NAPF 500-03-05 at time of paint system application.

d. Touch-up shop-applied prime coats that are damaged or have bare areas with primer recommended by paint manufacturer, after power tooling complying with NAPF 500-03 at the time of painting system application.

e. Remove all contamination on existing ductile and cast iron to sound surfaces by power tool cleaning complying with NAPF 500-03-03.

D. Non-Ferrous Metal Surfaces: Prepare non-ferrous metal surfaces for painting by light whip blasting or by lightly sanding with 60- to 80-mesh sandpaper.

E. Galvanized (Zinc-Coated) Surfaces: Prepare galvanized surfaces for painting by lightly sanding with 60- to 80-mesh sandpaper or by light whip blasting.

F. PVC and CPVC Piping and Fiberglass: Lightly sand and clean surfaces to be painted. Fiberglass surfaces shall be prepared by solvent washing to remove wax and other contaminants, before abrading surfaces with 60- to 80-mesh sandpaper to provide an anchor pattern with scratches no further apart than 1/16-inch.

G. Covering on Pipe Insulation:
   1. Remove all oil and surface contaminants as recommended by paint and insulation cover manufacturer for surface and application required.
   2. Do not cut or damage insulation and covering.

H. Gypsum Wallboard, and Plaster:
   1. Patch, sand, and seal rough spots before applying prime coat. Remove all dust and other contaminants prior to painting.
   2. Touch-up suction spots and hot spots with primer before applying finish coats.

3.3 PROTECTION OF PROPERTY AND STRUCTURES

A. Protect property and structures adjacent to the Work from waste residues resulting from cleaning, surface preparation and paint application.

B. Use shrouding, vacuum blasting, or other approved methods for cleaning and surface preparation of exterior surfaces.

C. During blast cleaning and surface preparation of interior and exterior surfaces, control discharge of dust and grit, using shrouding, negative-pressure containment/dust collection systems, or other means to protect adjacent property and structures and prevent dust/grit from escaping. Similarly control removal and temporary storage of residues to protect adjacent property and structures.

D. For painting of exterior surfaces, use rollers, shrouding or other approved methods as required to protect adjacent property and structures from wind-blown paint residues.

E. Submit proposed procedures for cleaning, surface preparation and paint application describing methods for protecting adjacent property and structures from residues. Do not proceed with cleaning, surface preparation or painting until proposed procedures are approved by ENGINEER.

3.4 MATERIALS PREPARATION

A. General:
   1. Mix and prepare paint products in strict accordance with paint manufacturer's product literature.
   2. Do not mix painting materials produced by different manufacturers, unless otherwise permitted by paint manufacturer's instructions.
   3. Where thinners are required, they shall be produced by paint system manufacturer unless otherwise permitted by paint manufacturer's product literature and submitted to and accepted by ENGINEER with Shop Drawings.

B. Tinting:
   1. Where multiple coats of the same material are to be provided, tint each undercoat a lighter shade to facilitate identification of each coat of paint.
   2. Tint undercoats to match color of finish coat of paint, but provide sufficient difference in shade of undercoats to distinguish each separate coat. Provide a code number to identify material tinted by manufacturer.

C. Mixing:
   1. For products requiring constant agitation, use methods in compliance with manufacturer's product literature to prevent settling during paint application.
   2. Mix in containers placed in suitably sized non-ferrous or oxide resistant metal pans to protect floors from slashes or spills that could stain the floor or react with subsequent finish floor material.
   3. Mix and apply paint in containers bearing accurate product name of material being mixed or applied.
   4. Stir products before application to produce a mixture of uniform density and as required during the application. Do not stir into the product film that forms on surface; instead, remove film and, if necessary, strain product before using.
   5. Strain products requiring such mixing procedures. After adjusting mixer speed to break up lumps and after components are thoroughly blended, strain through 35 to 50-mesh screen before application.

3.5 APPLICATION

A. General:
   1. Apply paint systems by brush, roller, or airless spray per manufacturer's recommendations and in compliance with Paint Application Specifications No. 1 in SSPC Volume 2, where applicable. Use brushes best suited for type of paint applied. Use rollers of carpet, velvet back, or high pile sheeps wool as recommended by paint manufacturer for product and texture required. Use air spray and airless spray equipment recommended by paint manufacturer for specific painting systems specified. Submit a list of application methods proposed, listing paint systems and location.
   2. Paint dry film thicknesses required are the same regardless of the application method. Do not apply succeeding coats until previous coat has completely dried.
   3. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint, until paint film is uniform finish, color, and appearance, particularly for intense chroma primary colors. Ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a film thickness equivalent to that of flat surfaces.
   4. Surfaces of items not normally exposed-to-view do not require the same color as other components of system of which they are part, but require the same painting system specified for exposed surfaces of system.

5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint before final installation of registers or grilles.
6. Paint backs of access panels and removable or hinged covers to match exposed surfaces.
7. Paint aluminum parts in contact with dissimilar materials with specified paint system.
8. Paint tops, bottoms, and side edges of doors the same as exterior surfaces.
9. Omit field-applied primer on metal surfaces that have been primed in the shop. Touch-up paint shop-primed coats and pre-finished items only when approved by ENGINEER using compatible primers and manufacturer's recommended compatible field-applied finishes.
10. Welds shall be stripe-coated with intermediate or finish coat of paint after application of prime coat.

B. Minimum/Maximum Paint Film Thickness:
1. Apply each product at not less than, nor more than, manufacturer's recommended spreading rate, and provide total dry film thickness as specified.
2. Apply additional coats of paint if required to obtain specified total dry film thickness.
3. Maximum dry film thickness shall not exceed 100 percent of minimum dry film thickness, except where more stringent limitations are recommended by paint manufacturer for a specific product.

C. Scheduling Surface Preparation and Painting:
1. As soon as practical after preparation, apply first-coat material to surfaces that have been cleaned, pretreated, or otherwise prepared for painting. Apply first-coat material before subsequent surface deterioration due to atmospheric conditions existing at time of surface preparation and painting. Surfaces that have started to rust before first-coat application is complete shall be brought back to required standard by abrasive blasting.
2. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure and application of another coat of paint does not cause lifting or loss of adhesion to undercoat.
3. Scarify primers and other painting system components by brush-blasting if paint has been exposed for lengths of time or under conditions beyond manufacturer's written recommendations for painting systems required, intended use, or method of application proposed for subsequent coats of paint.
4. Schedule cleaning and painting so that dust and other contaminants from cleaning process do not fall on wet, newly painted surfaces.

D. Prime Coats: Recoat 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 caused by insufficient sealing.

E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

F. Brush Application:
   1. Brush out and work all brush coats onto surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections are unacceptable. Neatly draw all glass and color break lines.
   2. Brush-apply primer or first coats, unless otherwise permitted to use mechanical applicators.

G. Mechanical Applicators:
   1. Use mechanical methods for paint application when permitted by governing ordinances, manufacturer, and approved by ENGINEER.
   2. Limit roller applications, if approved by ENGINEER, to interior wall finishes for second and third coats. Apply each roller coat to provide the equivalent hiding as brush-applied coats.
   3. Where spray application is used, apply each coat to provide equivalent hiding of brush-applied coats. Do not double back with spray equipment for purpose of building up film thickness of multiple coats in one pass.

H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint Work not in compliance with specified requirements as required by ENGINEER.

3.6 FIELD QUALITY CONTROL

A. ENGINEER may invoke the following material testing procedure at any time for a maximum of five times during field painting Work:
   1. CONTRACTOR shall engage service of an independent testing laboratory to sample paints used, as designated by ENGINEER. Samples of products delivered to Site shall be obtained, identified, sealed, and certified as to being products actually applied to surfaces in each area, in presence of CONTRACTOR.
   2. A testing laboratory selected by OWNER and paid for by CONTRACTOR shall perform appropriate tests for any or all of the following:
      a. Abrasion resistance.
      b. Apparent reflectivity.
      c. Flexibility.
      d. Washability.
      e. Absorption.
      f. Accelerated weathering.
      g. Dry opacity.
      h. Accelerated yellowness.
      i. Recoating.
      j. Skinning.
      k. Color retention.
      l. Alkali resistance.

m. Quantitative materials analysis.

3. If test results show that products being used do not comply with specified requirements, CONTRACTOR may be directed to stop painting Work and remove non-complying paint, and shall prepare and repaint surfaces coated with rejected paint with material complying with the Contract Documents.

B. Notify ENGINEER after completing each coat of paint. After inspection and checking of film thickness, holidays, and imperfections, and after acceptance by ENGINEER, proceed with succeeding coat. Perform testing using testing instruments specified in Article 2.4 of this Section.

1. ENGINEER will witness all testing and shall be notified of scheduled testing at least twenty-four hours in advance.
2. Apply additional coats, if required, to produce specified film thickness and to correct holidays and to completely fill all surface air holes.

C. For magnetic substrates, measure thickness of dry film nonmagnetic coatings following recommendations of SSPC PA-2. These procedures supplement manufacturers' approved instructions for manual operation of measurement gauges and do not replace such instructions.

D. Record time, location, number of coats, dry film thickness, holidays, and other imperfections and submit testing results to ENGINEER.

3.7 PROTECTION OF NEW FINISHES

A. Provide signs that read, "Wet Paint" as required to protect newly painted finishes. Remove temporary wrappings provided for protection of the Work after completion of painting.

3.8 ADJUSTING AND CLEANING

A. Correct damages to work of other trades through cleaning, repairing or replacing, and repainting, as acceptable to ENGINEER.

B. During progress of Work, remove from Site all discarded paint materials, rubbish, cans, and rags at end of each workday.

C. Upon completion of painting, clean paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, while avoiding scratching or otherwise damaging finished surfaces.

D. At completion of work of other trades, touch-up and restore damaged or defaced painted surfaces as determined by ENGINEER.

3.9 SCHEDULES

A. The schedules listed below, following the "End of Section" designation, are a part of this Specification section.
   1. Table 09 91 00-C, Painting Schedule.

TABLE 09 91 00-C
PAINTING SCHEDULE

Facility or Surface *	Room No.	Painting System **	Remarks
Electrical Room – Interior surfaces of CMU walls		A	
Dry Well – Ferrous Metals, Structural Steel, Exterior Surfaces of Valves and Piping		B	
Wet Well – Ferrous Metals, Non-Ferrous Metals; Exterior Surfaces of Piping		C	
Exterior – Ferrous Metals, Non-Ferrous Metals; Galvanized Metals		D	
Electrical Room – Gypsum Wallboard Ceiling		E	
Aluminum in Contact With Dissimilar Materials		F	

* Refer to Drawings for facility locations and for facilities not listed above.
** Refer to Article 2.2 of this Section.

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SECTION 10 14 00

SIGNAGE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to furnish and install signage.
   2. Extent of signage is shown and specified.
   3. Types of products required include the following:
      a. Room identification, information, entry and directional signs.
      b. Health, safety, warning, floor loading and fire extinguisher location signs.
      c. Pipe markers, tags, and equipment nameplates.
      d. Right-to-know labels, signs and tags.
      e. Stainless steel fasteners, supports, very-high-bond high-performance mounting tape, primers and other accessories.

B. Coordination:
   1. Coordinate adhesives and fasteners with mounting surfaces. Review other Sections to ensure compatibility of signage mounting accessories with various surfaces on which signage will be installed.
   2. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before signage Work.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AA DSA-45, Designation System for Aluminum Finishes.
   2. ASME A13.1 Scheme for the Identification of Piping Systems.
   3. ANSI/ICC A117.1, Accessible and Usable Buildings and Facilities.
   4. ANSI Z535.1, Marking Physical Hazards Safety Color Code.
   5. ANSI Z535.2, Environmental and Facility Safety Signs.
   6. ANSI Z535.3, Criteria for Safety Symbols.
   7. ASTM B26/B26M, Specification for Aluminum-Alloy Sand Castings.
   8. ASTM B584, Specification for Copper Alloy Sand Castings for General Applications.
   9. ASTM E527, Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS).
   10. CDA, Properties of Cast Copper Alloys.
   11. NFPA 704, System for the Identification of the Hazards of Materials for Emergency Response.
   12. UL 924, Safety of Emergency Lighting and Power Equipment.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Signage Manufacturers:
      a. Engage firms specializing in producing types of products specified, in compliance with the Contract Documents, with documented record of successful in-service performance, and that possess sufficient production capacity to avoid delaying the Work.
      b. Submit to ENGINEER name and experience record of manufacturers.

B. Component Supply and Compatibility:
   1. Obtain each separate type of signage from a single Supplier and from a single manufacturer.

C. Regulatory Requirements: Comply with applicable requirements of the following:
   1. OSHA, 29 CFR Part 1910.1200, Hazard Communication Standard.
   2. OSHA, 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances.
   3. OSHA, 29 CFR Part 1910.144, Safety Color Code for Marking Physical Hazards.
   4. OSHA, 29 CFR Part 1910. 145, Specification for Accident Prevention Signs and Tags.
   5. United States Access Board, Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines.
   6. Americans with Disabilities Act (ADA), Public Law 101-36, 28 CFR Part 36, Appendix A, Accessibility Guidelines for Buildings and Facilities (ADAAG), relative to characters and symbols contrast only.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Schedule of all signage required for the Work, indicating signage type location, and other information to demonstrate compliance with the Contract Documents.
      b. Fabrication and erection information for each type of signage
      c. Valve schedule for small-diameter valves, in accordance with this Section.
      d. Complete, camera-ready, color graphic layouts of custom- designed signs based on specified requirements and manufacturer recommendations.
      e Complete selection of each specified manufacturer's standard and custom graphic layouts and pictograms, colors, and alphabetic/text styles.
      f. Full-size graphic layout drawings for plaques, individual dimensional letters and numbers, and other items where final graphic appearance is

necessary prior to signage fabrication, incorporating all required graphic features specified or shown.

g. Mounting and Installation Data:
   1) Drawings of and information on anchorages and accessory items.
   2) Submit location template drawings for items supported or anchored to permanent construction.
   3) Coordinate mounting position, method, and proposed mounting accessories and fasteners with actual Project conditions. Indicate required mounting accessories on plan drawings showing locations of required exit signs based on measurements taken at the Site. Show final location and identify type of mounting surface for each exit sign. Coordinate location of exit signs for non-interference with other Work and as required by authorities having jurisdiction.

2. Product Data:
   a. Copies of manufacturer's technical data, including catalog information and specifications, for each product specified.

3. Samples:
   a. Each color and finish of exposed materials and accessories required for signage.
   b. Sample Signage:
      1) Full-size Sample of each type of permanent room and space identification sign, and informational and directional sign incorporating all features specified.
      2) Full-sized Sample of each type (such as snap-on, strap-on, and adhesive) of pipe marker proposed for use with mounting accessories.
      3) Full-sized Sample equipment nameplate, valve tag, pipe tag, and accessories. Stamp valve tag with information shown on valve schedules. When not indicated in the Contract Documents, information on the type of coding system will be furnished to CONTRACTOR by ENGINEER.
      4) Full-sized Sample right-to-know signs, labels and tags.
      5) Full-size representative sample of each individual-type letter and number specified, demonstrating alphabetic style/text type, material, color and finish specified.
   c. ENGINEER's review of Samples will be for color and texture only. Compliance with other requirements is CONTRACTOR's responsibility.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions:
      a. Templates for anchorages to be installed in concrete or masonry.
      b. Manufacturer's instructions and recommendations for support and foundations of signs installed outdoors.

C. Closeout Submittals: Submit the following:
   1. Warranty Documentation:

a. General and special warranties required under this Section.

D. Maintenance Material Submittals: Submit the following:
   1. Extra Stock Materials:
      a. Furnish extra stock materials from the same manufactured lot as the materials installed.
      b. Submit documentation of actual quantities of signage installed for the Project and calculations indicating the required quantity of extra stock materials.
      c. Furnish the following spare parts and accessories:
         1) For every 20 of each type (snap-on, strap-on, adhesive type) of pipe markers installed:
            a) One complete mounting assembly.
         2) For every 20 equipment nameplates installed:
            a) One complete nameplate mounting assembly.
         3) For every 20 valve tags and pipe tags installed:
            a) One stainless steel cable and splice.

1.5 WARRANTY

A. General Warranty: The special warranty specified for each type of sign in this Article shall not deprive OWNER of other rights or remedies OWNER may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under the Contract Documents. The obligations of CONTRACTOR under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.

B. Special Warranty on Products:
   1. Provide each signage manufacturer's written warranty, running to the benefit of OWNER, agreeing to correct, or at option of OWNER, remove or replace materials specified in this Section found to be defective during a period of five years after the date of Substantial Completion.
   2. Special warranty shall cover defective Work that includes, but is not limited to, the following:
      a. Deterioration of metal and polymer finishes beyond normal weathering.
      b. Deterioration of embedded graphic image colors and sign lamination.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. General:
   1. Details shown or indicated for signage, such as alpha-numeric and text type representation, letter spacing, designs of borders, and other graphic features,

are generic and intended only to establish text, general positions, and symbols.

2. Colors shall be brilliant, distinctive shades, matching the safety colors specified in ANSI Z535.1 and OSHA 1910.144.
3. Permanent rooms and spaces, and directional and informational signage where specified as accessible to people with disabilities, shall comply with ANSI/ICC A117.1 and ADA-ABA Accessibility Guidelines.
4. Accident prevention signs and tags shall comply with OSHA 1910.145.
5. Health, safety, and warning signs shall comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, OSHA 1910.144, and 1910.145, unless otherwise shown or indicated. Colors shall be as indicated in Table 1 of ANSI Z535.1. In addition to text, safety symbol pictograms shall be incorporated into each sign.

2.2 PANEL SIGNS – ROOM IDENTIFICATION, INFORMATION, ENTRY, AND DIRECTIONAL

A. Products and Manufacturers: Provide one of the following:
   1. Graphic Blast MP and FG ADA System and Custom Design ADA Series, by Best Sign Systems, Inc.
   2. Blast Etched Fiberglass and Blast Etched Melamine Signs, by Visigraph Corporation.
   3. Or equal.

B. Panel Signs – Room Identification, Information, Entry, and Directional:
   1. Product Description: Provide unframed signs, surface-etched, 1/32-inch raised tactile lettering and pictograms, sandblasted on an opaque sheet.
   2. Materials:
      a. Interior Signs: Three-ply, self-extinguishing melamine plastic.
      b. Exterior Signs: One-piece fiberglass.
   3. Size and Thickness: 0.125-inch thick; eight inches by eight inches with 1/2-inch radiused corners.
   4. Graphics and Text: White, Standard Helvetica Medium characters and matching arrow type-face; upper and lower case letters, one-inch high capitals and, in addition, Grade 2 Braille alphabet for room designation, directional, entry, and information signs.
   5. Colors and Contrast: Background of signs shall be eggshell, matte, or other non-glare finish. Characters and symbols shall contrast by at least 70 percent with their background as determined by ADA formula in ADAAG Appendix A4.30.5.

2.3 PANEL SIGNS – HEALTH, SAFETY, WARNING, FLOOR LOADING, AND FIRE EXTINGUISHER LOCATION

A. Product Description: Provide rigid fiberglass reinforced plastic signs with fade-resistant embedded graphics.

B. Products and Manufacturers: Provide one of the following:
   1. Graphic Blast Word and Picture Series, by Best Sign Systems, Inc.
   2. Blast Etched Fiberglass Signs, by Visigraph Corporation.
   3. Or equal.

C. General:
   1. Size and Thickness: 0.125-inch thick; 10 inches by 14 inches, unless otherwise shown or indicated.
   2. Graphics and Text: Standard Helvetica Medium characters and matching arrow type-face; upper and lower case, one-inch high capitals and, in addition, Grade 2 Braille alphabet message designations and other text.
   3. Exposure: As recommended by sign manufacturer for both indoor and outdoor use and with an upper service temperature limit of 190degrees F. Average durability for outdoor use shall be 15 years.

D. Safety Instruction Signs: Standard color of sign background shall be white; panel shall be green with white letters and numbers. Letters and numbers used against white background shall be black.

E. Caution Signs: Standard color of sign background shall be yellow; panel shall be black with yellow letters and numbers.

F. Danger Signs: Standard color of sign background shall be white; panel shall be black with red insert with white letters and numbers. Letters and numbers used against white background shall be black.

G. Warning Signs: Standard color of sign background shall be orange; panel shall be black with orange insert with black letters and numbers. Letters and numbers used against orange background shall be black.

H. No Smoking Signs: Standard color of sign background shall be white. Letters and numbers used against white background shall be red.

I. Biohazard Signs: Standard color of sign background shall be white; panel shall be black with white letters. Sign shall include red international biohazard pictogram on white background.

J. Floor Loading Signs: Standard color of sign background shall be white; panel shall be blue with white letters and numbers. Letters and numbers used against white background shall be black.

K. Fire Extinguisher Location Signs (surface-mounted units only): Standard color of sign background shall be red with white letters and numbers. Each sign shall include international fire extinguisher pictogram and directional arrow indicating location of fire extinguisher.

L. Auxiliary Products:
   1. Mounting Brackets: Provide sign manufacturer's standard mounting brackets for installing projected or double-sided signs.

2.4 PIPE MARKERS

A. Description:
   1. Provide pipe markers for each pipeline provided under the Contract, and for other piping indicated to receive pipe markers.

B. Products and Manufacturers: Provide one of the following:
   1. Custom High Performance Pipe Markers (B-689), and SnapOn and StrapOn Pipe Markers (B-915), by Brady Worldwide, Inc., Signmark Division.
   2. Custom Ultra-Mark High Performance Pipe Markers, by Seton Identification Products, a Tricor Direct Company.
   3. Or equal.

C. Pipe Markers:
   1. Lettering of Titles/Legend and Color Field Size:
      a. Letter size and color field length shall be as indicated in Table 10 14 00-A of this Section:

TABLE 10 14 00-A, PIPE MARKERS:
SIZE OF TEXT AND COLOR FIELD

Outside Diameter of Pipeline or Covering* (inches)	Size of Text (Legend Characters)	Minimum Length of Color Field**
3/4 to 1.25	1/2-inch	8 inches
1.5 to 1-7/8	3/4-inch	8 inches
2 to 5-7/8	1.25-inch	12 inches
6 to 9-7/8	2.5-inch	24 inches
10 and Larger	3.5-inch	32 inches
*Outside diameter includes pipe diameter plus insulation and jacketing. **Length of sign and color field shall be as required to accommodate required legend, and shall not be less than minimum length indicated unless required otherwise by space constraints.		

      b. Text and symbols shall be Standard Helvetica Medium, all upper case. Pipe markers shall include text with separate arrow signs indicating direction of flow of pipeline contents. Pipe markers with arrows shall be located as specified in Part 3 of this Section.
      c. Pipe markers indicating pipeline contents shall identify pipeline contents by complete name, as indicated in Table 10 14 00-B of this Section. Obtain from ENGINEER interpretation of required pipe marker text for pipelines provided under the Project that are not listed in Table 10 14 00-B of this Section.

2. Pipe Marker Materials:
   a. General: The following are applicable to all types of pipe markers furnished under this Section:
      1) Provide pipe markers with ultraviolet light-resistant, sealed, subsurface color graphics, recommended by sign manufacturer, suitable for both indoor and outdoor use.
      2) Pipe markers shall be resistant to abrasion, chemical reagents, and physical agitation such as washdowns and wind.
      3) Provide manufacturer's full selection of standard and custom sizes and graphics.
      4) Where manufacturer has established minimum order quantities for custom units provide minimum order quantities at no additional cost to OWNER.
   b. Materials: Provide the following at CONTRACTOR's option, suitable for outside diameter of the associated pipe and pipe covering:
      1) Adhesive, Wrap-Around Pipe Markers: Adhesive pipe markers shall be coiled construction, 0.006-inch total thickness, PVF over laminated polyester, with peel-off backing. Suitable for for service temperature ranging from -40 degrees F to 230 degrees F.
      2) Snap-on Pipe Markers: Snap-on pipe markers shall be cylindrically coiled, printed plastic sheets. Pipe marker total thickness for pipe and pipe covering from 3/4-inch to 2-3/8-inch outside diameter shall be not less than 0.020-inch. Pipe marker total thickness for pipe and pipe covering from 2.5-inch through six-inch ourside diameter shall be not less than 0.030-inch. Suitable for service temperature ranging from -40 degrees F to 180 degrees F.
      3) Strap-on Pipe Markers: Provide strap-on pipe markers where pipe diameter is large enough to preclude overlap of pipe marker material around the circumference of the pipe. Strap-on pipe markers shall be flat, printed plastic sheets, not less than 0.020-inch total thickness, constructed to be attached to the pipe with bands. Suitable for service temperature ranging from -40 degrees F to 180 degrees F. Provide each pipe marker with two 1/4-inch wide band straps of nylon, plastic, or stainless steel, lengths as required by circumference of pipe and pipe covering. Provide manufacturer's recommended banding tools for banding.
3. Legend for Pipe Markers: Pipe markers shall have the text or abbreviations in the color combinations indicated in Table 10 14 00-B of this Section to identify the pipeline service hazard. Pipe marker colors shall comply with ASME A13.1, unless otherewise indicated.

TABLE 10 14 00-B,
SCHEDULE OF PIPE MARKERS*

Pipeline Legend	Lettering/Text Color	Background Color
WATER		
City Water	White	Green

TABLE 10 14 00-B, SCHEDULE OF PIPE MARKERS*		
Pipeline Legend	**Lettering/Text Color**	**Background Color**
Cold Water	White	Green
FUELS AND LUBRICANTS		
Diesel Fuel Oil	White	Brown
PROCESS		
Sewage	Black	Orange
Sump Drains	White	Gray
Wastewater	Black	Orange

* Where shown or specified, the legend for blowoff, drain, metering, sump, vent, and similar pipelines shall also include the equipment number or structure name, as applicable, served by the pipeline. Provide the number in the same color as the pipeline.

2.5 EQUIPMENT NAMEPLATES

A. Description:
   1. Provide equipment nameplate for each equipment item furnished under the Contract, and for other equipment items indicated to receive nameplates. Equipment nameplates specified in this Article are in addition to equipment manufacturer's standard nameplate with manufacturer name, model number, serial number, and similar information.
   2. Install equipment nameplates as indicated in Part 3 of this Section. Mechanically fasten equipment nameplates to the associated equipment item.

B. Products and Manufacturers: Provide one of the following:
   1. Stainless Steel (HEET) Tags (B-748) custom engraved, by Brady Worldwide, Inc.
   2. Custom Engraved Stainless Steel Nameplates, by Seton Identification Products, a Tricor Direct Company
   3. Or equal.

C. Equipment Nameplates:
   1. Material: Type 304 or Type 316 stainless steel, 26-gage, with rounded corners. Suitable for temperatures ranging from -40 to 89 degrees C.
   2. Provide each equipment nameplate with not less than two holes, each approximately 3/16-inch diameter, for mechanically fastening nameplate to the associated equipment. Provide appropriate stainless steel fasteners.

3. Nameplate Size:
    a. Size shall be as required for required text, and shall be not less than one-inch by four inches.
4. Text Engraved on Nameplates:
    a. Text Size: Equipment nameplate titles shall have text as large as possible to fit on nameplate; text shall be not less than 1/2-inch high. All text on a given nameplate shall be one size.
    b. Text and symbols shall be Standard Helvetica Medium, all upper-case.
    c. Left-justify multiple lines of text
    d. Where more than one item of the same type of equipment is furnished, consecutively number each associated equipment nameplates as shown or indicated; for example “Pump No. 1”, “Pump No. 2”, “Pump No. 3”, and so on.
5. Legend for Nameplates:
    a. Nameplates for equipment, including operating stands for valves and gates, shall be in accordance with the required text and colors indicated in Table 10 14 00-C.
    b. Obtain interpretation from ENGINEER for equipment not included in Table 10 14 00-C.

TABLE 10 14 00-C,
SCHEDULE OF EQUIPMENT NAMEPLATES*

Legend		Color	
First Line	**Second Line**	**Lettering/Text**	**Background**
Air Conditioning Unit	**		
Bar Screen	**		
Condensate Pump	**		
Diesel Tank	**		
Engine Generator	**		
Sewage Flow Meter	**		
Sewage Pump	**		
Standby Generator	**		
Sump Pump	**		
Supply Fan	**		

* Where equipment is installed on roofs or where exposed to the public view such as in lobby or office areas, color will be selected by ENGINEER.

** The legend on the indicated nameplates shall also include the appropriate number designation for such equipment, including valve stands and gate operators as shown on the Process and Instrumentation Drawings or as indicated by ENGINEER.

D. Operating Stands for Valves and Gates:
   1. Nameplate material, size, and text requirements are the same as indicated above for other equipment nameplates.
   2. Operating stands for valves and gates shall carry the respective legends "V. No. ___" or "S.G. No. ___," with the appropriate equipment number to be indicated by ENGINEER.
   3. Background and text color of nameplates for valve and gate operators shall be the same colors specified above for other equipment nameplates.

2.6 VALVE AND PIPELINE TAGS

A. Products and Manufacturers: Provide one of the following:
   1. Custom Engraved Stainless Steel Valve Tags, by Brady Worldwide, Inc.
   2. Custom Stainless Steel Valve Tags, by Seton Identification Products, a Tricor Direct Company
   3. Or equal.

B. Metal Tags:
   1. For each valve and for pipelines smaller than 3/4-inch outside diameter, provide permanently-legible, round metal tags, each two-inch diameter, Type 304 or Type 316 stainless steel, with engraved lettering filled with black enamel. Provide tags with 3/16-inch diameter hole located that does not interfere with legend.
   2. Legend for Valve Tags:
      a. Based on information provided on the Drawings, submit to ENGINEER not less than fourteen days before system startup, a valve schedule indicating all required valves.
      b. For each valve, the valve schedule shall indicate: location, valve type, valve number, words to identify valve's function, type of operator, and normal operating position.
      c. Information presented in the valve schedules shall be coded on tags in a system provided by or acceptable to OWNER. Each valve shall be coded and identified by ENGINEER utilizing a combination of up to twelve letters and numbers.
   3. Legend for Small Pipeline Tags: Comply with requirements for pipe markers relative to legend. Where legend is not indicated, obtain interpretation from ENGINEER.
   4. Miscellaneous Valve and Small Pipeline Tag Accessories:
      a. Stainless Steel Wire: Nylon-coated; 0.048-inch outside diameter.
      b. Clamps: Brass.
      c. Lead Seals: Monel; four ply, 0.014-inch by 10 inches long; for attaching tags.
      d. Hand Sealing Press: As recommended by tag manufacturer for crimping lead seals.

2.7 PANEL SIGNS – RIGHT-TO-KNOW LABELS, SIGNS, AND TAGS

A. Products and Manufacturers: Provide one of the following:
   1. Custom B-302 Pressure Sensitive Polyester Right-To-Know Labels, B-120 Fiberglass Chemical Tank Signs, Front No. 1/Back No. 1 B-851 Right-To-Know Accident Prevention Tags and Right-To-Know Pictograms, by Brady Worldwide, Inc.
   2. Right-to-Know & HazCom Signs, Labels, and Tags, by Seton Identification Products, a Tricor Direct Company.
   3. Or equal.

B. General:
   1. Right-to-know signs, labels, and tags shall use NFPA 704 “diamond” hazard identification systems and shall comply with OSHA 1910.1200 and OSHA Subpart Z.

C. Tank Signs:
   1. Provide quantity of signs shown or indicated, sized at 14 inches by 20 inches, identifying the chemical stored in the tank, chemical's hazards, required protective equipment in text and pictograms, first-aid for eyes, skin, ingestion and inhalation, information on confined space entry and NFPA 704-required hazard rating system information.
   2. Right-to-know fiberglass signs for storage tanks shall have pressure-sensitive adhesive backs and be provided with subsurface numbers, symbols, text, and legends. Labels shall indicate chemical name and chemical abstracts service number, fire and health hazard potential, reactivity, personal protection and target organ legends in compliance with NFPA 704 format and OSHA 1910.1200.

D. Labels: Provide right-to-know polyester labels for each hazardous chemical container. Provide labels seven inches by ten inches with information pre-printed by manufacturer. Provide labels with two-mil polyester overlaminate and with a complete line of all standard and custom pictograms.

E. Tags: Provide 15-mil right-to-know vinyl tags with self-adhering clear polyester overlaminate. Tags shall be laminated plastic and provided with nylon tie fasteners. Provide tags three inches by 5.75 inches with two chamfered corners with reinforced 3/16-inch diameter grommeted hole.

2.8 AUXILIARY MATERIALS

A. Very-High-Bond High-Performance Bonding Tape:
   1. Provide all surface-mounted signage with very-high-bond foam tape backing except where specified as requiring mechanical fasteners.
   2. Products and Manufacturers: Provide one of the following:

a. Scotch Brand (Very-High-Bond) 4942 VHB Double Coated Acrylic Foam Tape and No. 94 Acrylic Primer, by 3M Industrial Tape and Specialties Division.
b. Or equal.

3. Provide a very-high-bonding pressure sensitive joining system consisting of double-coated conformable acrylic foam tape and release liners.
4. Thickness: 0.045-inch.
5. Tape Width: 1.5 inches.
6. Color: Dark gray.
7. Bonding Adhesive: Acrylic; very-high-bond, solvent and shear resistance.
8. Primer: High-performance tape manufacturers recommended acrylic primer.

B. Fasteners: Provide fasteners of non-magnetic stainless steel of size and type required and recommended by the associated individual signage manufacturer.

C. Anchors and Inserts: Provide nonferrous metal or hot-dipped galvanized anchors and inserts. Provide toothed stainless steel or lead expansion bolts for drilled-in-place anchors.

D. Mounting Brackets:
1. Provide manufacturer's standard mounting brackets for each of the following sign types: hanging, projected, double-sided.
2. Provide inserts, and mechanical and adhesive anchoring devices as specified in this Article for installation of signage.

2.9 FABRICATION

A. Shop Assembly:
1. Fabricate and preassemble items in the shop to the greatest extent possible.
2. Disassemble units only to extent necessary for shipping and handling limitations.
3. Clearly mark units for reassembly and coordinated installation.

2.10 SOURCE QUALITY CONTROL

A. Fabrication Tolerances:
1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within tolerance of plus or minus 1/16-inch measured diagonally across each sign.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine substrates and conditions under which signage will be installed and notify ENGINEER in writing of conditions detrimental to the proper and timely

completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
   1. Location:
      a. Install signage and appurtenances at the locations shown or indicated. When locations are not shown or indicated, install signage at locations directed by ENGINEER.
      b. Provide exit signs at locations shown or indicated. Surface-mount signs above each point of egress, unless otherwise shown or indicated.
      c. Lightly mark and locate position of each sign. Obtain ENGINEER's acceptance of marked locations before mounting.
   2. Installation – General:
      a. Install signs level, plumb, and at proper height.
      b. Signage shall be securely mounted with concealed, very-high-bond acrylic foam tape, specified adhesives, or mechanical fasteners where specified. Attach signs to surfaces in accordance with sign manufacturer's instructions, unless otherwise shown or indicated.
      c. Provide very-high-bond acrylic foam tape on back of signage using a full perimeter of specified tape. Leave no gaps in tape perimeter at back of signage; peel off second release liner and press onto surfaces.
   3. Repair or replace damaged units.

B. Panel Signs – Room Identification, Directional, and Information Signs:
   1. Where permanent identification is provided for rooms and spaces, install signs on the wall adjacent to the latch side of the door.
   2. Where there is no wall space on the latch side of the door, including at double leaf doors, install signs on the nearest adjacent wall.
   3. Mounting height shall be in accordance with ADA-ABA Accessibility Guidelines in areas accessible to disabled people. For other areas install signs with five feethes from the finished floor to centerline of sign. Mount such signage so that a person may approach within three inches of the sign without encountering protruding objects or, when reading sign, be forced to stand within the swing of a door.

C. Pipe Markers, Equipment Nameplates, and Pipe and Valve Tags:
   1. Location of Pipe Markers and Pipe Tags:
      a. Provide pipe markers with text (pipeline contents or service) and adjacent arrow indicating the direction of flow of pipeline contents on each piping system provided under the Project and other piping systems shown or indicated as to receive pipe markers.
      b. Locations: Provide pipe markers at each of the following locations:
         1) At intervals of not more than 30 linear feet apart
         2) Directly adjacent to each side of each penetration by the pipeline of the following: wall, floor, ceiling, roof.

3) Adjacent to each change in flow direction.
4) On each branch where pipes connect together including but not limited to tees, wyes, and crosses.
5) Adjacent to each side of each valve (including but not limited to check valves, isolation valves, control valves, and other valves), strainer cleanouts, and each equipment item along the pipeline.
6) Comply with ASME A13.1.

c. Provide flow-direction arrows at intervals not greater than 15 linear feet. Where flow may be bi-directional, provide arrows adjacent to each other to indicate both directions.

d. Pipe marker locations will be determined by ENGINEER, but in general place pipe markers where personnel view of label is unobstructed. When pipeline is overhead, install label on the two lower quarters of the pipe or pipe covering. Pipe markers shall be clearly visible from personnel operating positions, especially operating positions adjacent to valves and equipment.

e. Provide pipe tags, where specified, at locations as specified for pipe markers.

2. Location of Valve Tags and Valve Nameplates:
   a. Valve nampeplates and valve signs for large valves shall be located on or adjacent to the valve.
   b. For smaller valves, attach tags to valve bonnet or valve flange bolts.
   c. For valves to receive equipment nameplates, as specified in this Section, install nameplate as requied for other equipment nameplates.
   d. Do not attach tags, nameplates, or signs to valve handwheels or other valve actuators.
3. Equipment Nameplates:
   a. Locate nameplates on equipment bases and on structures at readily-visible elevation in such positions relative to the equipment and structures as to prevent damage to nameplate.
   b. Position nameplace for ease of reading by operations and maintenance personnel.

D. Panel Signs – Right-To-Know Signs, Labels, and Tags:
1. Locate tags at intervals of not more than 20 feet center-to-center along chemical pipelines and fill pipelines and on each side of locations where pipelines emerge from penetrations with other materials.
2. Install tank signs on each tank shown or indicated to receive signage at quarter-points on tank circumference, five feet above finished floor.

3.3 PROTECTION AND CLEANING

A. After installation, clean soiled signage surfaces in accordance with manufacturer's written instructions.

B. Protect signage from damage until completion of the Work.

+ + END OF SECTION + +

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install all fire protection specialties Work.
   2. Extent of fire protection specialties Work is shown and specified.
   3. Types of fire protection specialties Work required includes:
      a. Dry chemical extinguishers.
      b. Carbon dioxide extinguishers.
      c. Recessed fire extinguisher cabinets.
      d. Mounting accessories and miscellaneous fasteners.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate installation of items that must be installed with or before fire protection specialties.

C. Related Sections:
   1. Section 10 14 00, Signage.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM E814, Test Method for Fire Tests of Penetration Firestop Systems.
   2. FM Global, FM Approval Guide.
   3. NFPA 10, Portable Fire Extinguishers.
   4. UL Fire Classification Rating.
   5. U.S. Architectural & Transportation Barriers Compliance Board's Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities.

1.3 QUALITY ASSURANCE

A. Component Supply and Compatibility:
   1. Provide fire protection specialties products from one manufacturer.

B. Certifications: Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2. Provide fire extinguishers approved, listed, and labeled to comply with ASTM E814.

C. Regulatory Requirements:
1. Provide fire protection specialties approved and labeled by UL.
2. Provide fire protection specialties conforming to NFPA 10 requirements.
3. Provide fire protection specialties conforming to ADA-ABA Accessibility Guidelines.

1.4 SUBMITTALS

A. Action Submittals:
1. Product Data: Submit the following:
a. Manufacturer's technical data, certification of UL rating, and installation instructions for fire protection specialties.
b. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
c. Product Schedule: For fire extinguishers and fire protection cabinets. Coordinate final fire extinguisher and fire protection cabinet schedule to ensure proper fit and function.

B. Closeout Submittals: Submit the following:
1. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.
2. Warranty: Sample of special warranty.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. General: Provide manufacturer's standard mounting brackets for portable fire

extinguishers size as specified.

B. Multi-Purpose Dry Chemical Fire Extinguishers:
   1. Ten-pound capacity, enameled steel container with pressure-indicating gauge, for Class A, Class B, Class C fires, UL rating 4A-60 B:C.
   2. Products and Manufacturers: Provide one of the following:
      a. Cosmic Model 10E by J.L. Industries, a division of Activar Construction Products Group.
      b. MP 10 Series by Larsen's Manufacturing Company.
      c. Or equal.

C. Carbon Dioxide Fire Extinguishers:
   1. Ten-pound enameled steel container capacity UL rating 10 B:C.
   2. Products and Manufacturers: Provide one of the following:
      a. Sentinel Model 10 by J.L. Industries, a division of Activar Construction Products Group.
      b. CD 10 Series by Larsen's Manufacturing Company.
      c. Or equal.

D. Identification: Refer to Section 10 14 00, Signage.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine substrates and conditions under which fire protection specialties will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to ENGINEER.

3.2 INSTALLATION OF FIRE EXTINGUISHERS

A. When exact locations of fire protection specialties are not shown on Drawings, locate as directed by ENGINEER.

B. Securely fasten products to structure, square and plumb, per Supplier's instructions. Mounting heights shall be:
   1. Install fire extinguishers to meet ADA/ABA requirements.
   2. Install fire extinguishers with gross weight greater than 40 pounds with top of fire extinguisher no more than 3.5 feet above finished floor.
   3. Install fire extinguishers with gross weight less than 40 pounds with top of fire extinguisher no more than 4.0 feet above finished floor.
   4. Clearance between bottom of fire extinguisher and finished floor shall be at least four inches.

C. Identification Devices: Refer to Section 10 14 00, Signage.

D. Recharge fire extinguishers provided under this Contract so that most recent inspection date coincides as nearly as possible with date of Substantial Completion. Inform OWNER in writing of next required inspection and recharging date.

3.3 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.4 FIRE EXTINGUISHER SCHEDULE

A. Type A – Dry chemical, wall mounted: Two in the Dry Well as shown.

B. Type B – Carbon dioxide, wall mounted: One in the Electrical Room as shown.

+ + END OF SECTION + +

SECTION 22 00 05

PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install potable water, sanitary drainage, storm drainage and gas piping systems complete and operational with accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the plumbing Work.

C. Related Sections:
   1. Section 09 91 00, Painting.
   2. Section 40 05 31, Thermoplastic Process Pipe.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. ANSI A21.1, Practice Manual, Computation Strength, Thickness.
   2. ANSI A21.4, Cement-Mortar Lining/Cast and Ductile Iron Pipe and Fittings.
   3. ANSI A21.10, Cast-Iron and Ductile Iron Fittings, 2 thru 48 in. Water.
   4. ANSI A21.11, Rubber Gasket Joints Cast and Ductile Iron Pressure Pipe.
   5. ANSI A21.51, Ductile-Iron Pipe Centrifugal Cast, in Metal Molds.
   6. ANSI A112.19.2M, Vitreous China Plumbing Fixtures.
   7. ANSI A117.1, Accessible and Usable Buildings and Facilities.
   8. ANSI B16.9, Factory-Made Wrought Buttwelding Fittings.
   9. ANSI B16.12, Cast-Iron Threaded Drainage Fittings.
   10. ANSI B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
   11. ANSI B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings. (ASME B16.22).
   12. ANSI B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150 and 300 lbs. (ASME B16.24).
   13. ANSI B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
   14. ANSI B16.33, Manually Operated Metallic Gas Valves for Use in Gas Piping Systems Up to 125 PSI (Sizes NPS 1/2 through NPS 2). (ASME B16.33).
   15. ANSI B16.39, Malleable Iron Threaded Pipe Unions.
   16. ANSI B16.42, Ductile Iron Pipe Flanges and Flanged Fittings.

17. ANSI B40.1, Gages-Pressure Indicating Dial Type-Elastic Element.
18. ANSI B125.2, Black and Hot-Dipped Zinc-Coated Welded and Seamless Pipe, (ASTM A 120).
19. ANSI H23.1, Seamless Copper Water Tube, (ASTM B 88).
20. American Society of Sanitary Engineering (ASSE), ASSE 1013, Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.
21. ASTM A 53/A 53M, Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated, Welded and Seamless Pipe.
22. ASTM A 74, Specification for Cast-Iron Soil Pipe and Fittings.
23. ASTM A 106/A 106M, Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
24. ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
25. ASTM A 888, Specification for Hubless Cast-Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
26. ASTM B 32, Specification for Solder Metal.
27. ASTM B 88, Specification for Seamless Copper Water Tube.
28. ASTM C 564, Specification for Rubber Gaskets for Cast-Iron Soil Pipe and Fittings.
29. ASTM D 1330, Specification for Rubber Sheet Gaskets.
30. AWWA C511, Reduced-Pressure Principle Backflow Prevention Assembly.
31. CISPI 310, Specification for Coupling for use in Connection with Hubless Cast-Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
32. CISPI HSN, Specification for Neoprene Rubber Gaskets for Hub and Spigot Cast 300N Soil Pipe and Fittings.
33. FS O-F-506, Flux, Soldering: Paste and Liquid.
34. FS WW-H-171, Hangers and Supports, Pipe.
35. FS QQ-C-40, Calking Lead Wool and Lead Pig.
36. FS WW-P-541/1, Plumbing Fixtures (Water Closet).
37. FS WW-U-516, Unions, Brass or Bronze, Threaded Pipe Connections and Solder-Joint Tube Connections.
38. FS WW-U-531, Unions, Pipe, Steel or Malleable Iron; Threaded Connection.
39. Manufacturers Standardization Society (MSS), MSS SP 69, Pipe Hangers and Supports – Selection and Application.
40. NFPA 54, Nation Fuel Gas Code.

1.3 QUALITY ASSURANCE

A. Installer's Qualifications:
   1. Engage installer regularly engaged in plumbing piping installation and with experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications to ENGINEER.

2. Engage installers for the entire plumbing piping systems with undivided responsibility for performance and other requirements.

B. Regulatory Requirements: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
   1. National Electrical Code, (NEC).
   2. Local and State Building Codes and Ordinances.
   3. Westchester County Department of Health (WCDOH).
   4. Westchester Joint Water Works (WJWW).

C. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single plumbing manufacturer.
   2. The plumbing manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the plumbing manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. 1/4-inch scale piping layouts, dimensioned to show length of piping runs, pipe sizes, support spacing and expansion provisions.
      b. Details of installation, including piping supports.
      c. Submit pipe schedule with laminate construction, sizes, thickness, vacuum pressure, weight per foot pressure, spans, joint type and flange data.
   2. Product Data:
      a. Manufacturer's literature, illustrations, specifications and engineering data.
      b. Flexible connections.
      c. Additional technical data related to the specified material and equipment as requested by ENGINEER.
      d. Gasket material.

B. Informational Submittals: Submit the following:
   1. Qualifications Statements:
      a. Installer's qualifications.

C. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Data:
      a. Submit operation and maintenance manuals including test reports, maintenance data, and schedules, description of operation, and spare parts information for the backflow preventer and heated enclosure.

b. Provide operation and maintenance manuals per Section 01 78 23, Operations and Maintenance Data.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of the Work.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions

1.6 GENERAL REQUIREMENTS

A. The Contract Documents show the general arrangement and extent of the Work to be completed. The exact location and arrangement of all parts shall be determined as the Work progresses. The exact location of all parts of the Work must be governed by the general building plans and the actual building conditions.

B. The Drawings show an indication of the arrangement of equipment, ducts, valves, etc., and are as nearly correct as can be determined in advance of the actual construction of the Work. Piping, equipment, ducts, etc., found to interfere with the construction of the building, plumbing apparatus and piping, electrical wiring or other obstructions, etc., must be changed in location to clear such obstructions.

C. The connections shown to the various units are intended as an indication only. The actual connections at the time of installation to be made and arranged to suit the requirements of each case, adequately provide for expansion and perfect circulation and minimize the amount of space required for the same.

D. The Drawings show the general arrangement of all systems. Should local conditions necessitate rearrangement of one or more of the systems,

CONTRACTOR, before proceeding with the Work, shall prepare and submit complete drawings showing all details of the proposed rearrangement for written approval by the ENGINEER.

E. The Drawings do not show all offsets, fittings, accessories and details, which may be required. CONTRACTOR shall carefully examine all of the General Construction, Electrical, Mechanical, Structural and other Drawings and the respective Specifications for conditions which may affect the installation of the Work, and shall arrange the Work accordingly, furnishing all required items to meet such conditions which are not specified as work "by others", to complete the systems to the true extent of the Contract Documents.

PART 2 - PRODUCTS

2.1 HOT AND COLD WATER PIPING

A. Copper Water Tube:
   1. Tube:
      a. Reference: ANSI H23.1, ASTM B 88.
      b. Type: K or L.
      c. Temper: Hard-drawn or soft-annealed.
   2. Fittings:
      a. Reference: ANSI B16.22.
      b. Reference: ANSI B16.26.
      c. Reference: ANSI B16.18.
   3. Joints:
      a. Sweat:
         1) Solder Metal: ASTM B 32, Type 95-5TA.
         2) Flux: FS O-F-506, Type 1.
      b. Flanged:
         1) Flanges: ANSI B16.24, 150 lb. class.
         2) Gaskets: Red rubber, ASTM D 1330, Grade 1, 1/8-inch thick.
         3) Nuts and Bolts: ASTM A 307.
   4. Unions:
      a. Reference: FS WW-U-516.
      b. Material: Bronze.
      c. Rating: 250-pound W.O.G.

B. Dielectric Couplings:
   1. Manufacturers: Provide products of one of the following:
      a. Watts Regulator Company.
      b. Epco Sales, Incorporated.
      c. Or equal.
   2. Type: Union or flange.
   3. Ratings:
      a. Unions: 250 psi, ANSI B16.39.
      b. Flanges: 175 psi, ANSI B16.42 (Iron), ANSI B16.24 (Bronze).

2.2 VALVES AND ACCESSORIES

A. Bronze Body Globe Valves:
   1. Products and Manufacturers: Provide one of the following:
      a. Stockham Valves and Fittings, Fig. No. B-24.
      b. Lunkenheimer Company, Fig. No. 126.
      c. Or equal.
   2. Type: Composition disc, union bonnet.
   3. Materials: Brass and bronze.
   4. Rating: 150 lb. SWP.
   5. End Connections: Solder joint.

B. Bronze Body Check Valves:
   1. Products and Manufacturers: Provide one of the following:
      a. Stockham Valves and Fittings, Fig. No. B-309.
      b. Lunkenheimer Company, Fig. No. 2145.
      c. Or equal.
   2. Type: Swing, regrinding bronze disc, screw-in cap.
   3. Materials: Brass and bronze.
   4. Rating: 150 lb. SWP.
   5. End Connections: Solder joint.

C. Bronze Body Ball Valves:
   1. Products and Manufacturers: Provide one of the following:
      a. Stockham Valves and Fittings, Fig. S-217 BR-R-T.
      b. Lunkenheimer Company, Fig. 707-XLT.
      c. Or equal.
   2. Type: Non-blowout stem, adjustable packing gland, quarter turn, full port ball valve.
   3. Materials:
      a. Body: Cast bronze.
      b. Ball: Chrome plated brass.
      c. Packing and Seats: Teflon.
   4. Rating: 150 lb. SWP.
   5. End Connection: Screwed. Provide screwed to sweat adapters, where required.

D. Lubricated Stop Cocks (Up to 2-inches):
   1. Manufacturers: Provide products of one of the following:
      a. Eclipse Fuel Engineering Company.
      b. A. Y. McDonald Manufacturing Company.
      c. Or equal.
   2. Type: Flat head.
   3. Pressure Rating: 125 lb. W.O.G.
   4. End Connections: Threaded.
   5. Construction: Iron body, bronze plug.

2.3 EQUIPMENT

A. Hose Bibbs, Pipe Drains:
   1. Products and Manufacturers: Provide one of the following:
      a. Woodford Manufacturing Company, Model 24C.
      b. Nibco, Incorporated, Fig. No. 74VB.
      c. Or equal.
   2. Valve:
      a. Type: Indoor/non-freeze area boiler drain globe valve, chrome plated.
      b. Materials: Bronze body, screwed bonnet, renewable composition disc.
      c. End Connections: Hose thread outlet, male pipe thread or sweat inlet.
      d. Rating: 125 lbs. W.O.G.
   3. Vacuum Breaker:
      a. Type: Non-removable, atmospheric.
      b. Materials: Brass body, stainless steel trim, silicone rubber diaphragm and disc.
      c. End Connections: Hose thread inlet and outlet.

B. Pressure Gages:
   1. Manufacturers: Provide products of one of the following:
      a. Weksler Instrument Company.
      b. H.O. Trerice Company.
      c. Or equal.
   2. Reference: ANSI B40.1 for Grade AA gages.
   3. Type: Direct mounted, dial type pressure gage.
   4. Construction:
      a. Case: Six-inch diameter cast aluminum, flangeless with black finish and bottom 1/4-inch N.P.T.
      b. Ring: Chrome plated close type.
      c. Dial: White face, black numbers and graduations.
      d. Window: Glass or clear acrylic plastic.
      e. Pointer: Micrometer type, black finish, red tip.
      f. Movement: Stainless steel, rotary type, delrin sector and bushings.
      g. Bourdon Tube: Seamless phosphor bronze, Grade A over pressured and stress relieved.
      h. Socket and Tip: Forged brass, alloy steel and Type 316 stainless steel.
   5. Accuracy: One percent, minimum.
   6. Gage Cocks: Provide brass tee handle cock before each gage.

C. Backflow Preventers: RPZ-BFP:
   1. Products and Manufacturers: Provide one of the following:
      a. Febco, Model 825.
      b. Watts Regulator Company, Series 919.
      c. Or equal as listed on the List of Approved Backflow Prevention Assemblies generated by the University of Southern California Foundation for Cross Connection Control and Hydraulic Research (FCCCHR).

2. Type: Reduced pressure zone device with two independently acting check valves, together with an automatically operated pressure differential relief valve located between the two check valves.
3. Materials:
    a. Body: Bronze.
    b. Valve Discs: Buna-N rubber.
    c. Diaphragm: Silicone rubber or Buna-N rubber.
    d. Springs: Stainless steel.
    e. Screws: Stainless steel.
4. Maximum Working Pressure: 150 psi.
5. End Connections: Screwed.
6. Accessories:
    a. Air gap drain funnel with threaded outlet and vent elbow furnished by manufacturer minimum two pipe sizes larger than relief drain outlet.
    b. Strainer with blowoff on inlet.
    c. Ball valves on inlet and outlet.
    d. Reduced pressure principle backflow preventer test kit for each unit furnished, provided in molded plastic carrying case with foam inserts.
7. References: ASSE 1013, AWWA C511.

D. Hangers and Supports:
1. Manufacturers: Provide products of one of the following:
    a. ITT Grinnell Corporation.
    b. B-LINE.
    c. Or equal.
2. Type: Clamps, hooks, rods, hangers used to support plumbing piping systems from the structure.
3. Materials: Comply with the requirements of MSS SP 69, FS WW-H-171 latest edition, Underwriters' Laboratory listed and Factory Mutual approved.

E. Heated Enclosure:
1. General: Furnish and install a complete heated enclosure assembly for meters and backflow prevention as shown on the Drawings.
2. Qualifications: Manufacturer shall have a minimum of five years experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.
3. Manufacturers: Provide products of one of the following:
    a. Hox Box® by Hubbell Power Systems, Inc. – Model HF026070045
    b. Or equal.
4. Enclosure:
    a. Provide flip top cover.
    b. Enclosure assembly shall be shipped fully assembled.
    c. Provide lockable enclosure.
    d. Provide drain ports sized for full port backflow discharge and that are designed for one way operation allowancing backflow discharge but not allowing wind, debris, and small animals to enter the enclosure.
    e. Minimum vertical load: 100 lbs/sf.

f. Minimum wind speed: 120 mph.
g. Enclosures to be ASSE 1060 certified.

5. Materials:
   a. Fiberglass Enclosure: Minimum 1/8-inch thick Thixotropic polyester resin reinforced with fiberglass strand. Provide smooth yacht quality finish protected with UV inhibited isophthalic polyester gel coat.
   b. Non molded products will utilize an Industrial exterior texture.
   c. No wood or particle board to be used in the construction.
   d. Insulation shall be 1”-1.5" unicellular, non-wicking, polyisocyanate foam frothed or sprayed in place.
   e. The Insulation shall have the following properties:
      1) R-Value: 8
      2) Dimensional Stability: Less than 2% linear change.
      3) Compressive Strength: 51 psi.
      4) Flame Point: 325 degrees.
      5) Water Adsorption: 0.037 psf.
      6) Porosity: 91%.
6. Heating Equipment:
   a. Provide heating equipment to protect piping and equipment from exterior temperatures of -30 degrees F.
   b. ETL listed thermostatically controlled wall mounted air forced heaters or UL listed self regulating cable(s) shall be furnished and designed by the enclosure manufacturer to maintain the equipment at +40◦F, in accordance with ASSE 1060 1.2.2.1.
   c. Heating equipment shall be mounted to the supplied heater plates and/or a minimum 8” above the slab unless it is UL or ETL certified and NEC approved for submersion.
   d. Power source shall be protected with a GFI receptacle, U.L. 943, NEMA 3R. Mounted a minimum of 8” from the bottom of the receptacle to the top of the slab.
   e. Separate 20 amp circuits (wall mounted) and 15 amp circuits (self regulating cables) are recommended, so in the event a circuit fails all other circuits will remain powered. Installations must be in accordance with the local and national codes.
   f. The heaters shall be UL or ETL listed for wet/damp locations.

2.4 INSULATION

A. Fiberglass Insulation:
   1. Products and Manufacturers: Provide one of the following:
      a. Owens-Corning Fiberglass Corporation, Fiberglass 25ASJ/SSL.
      b. Certain Teed Products Corporation, Certain Teed Snap-On ASJ-SSL.
      c. Or equal.
   2. Type: Heavy-density sectional pipe insulation with vapor barrier with self-sealing lap.
   3. Fire Hazard Classification:
      a. Flame Spread: 25.
      b. Fuel Contributed: 50.

c. Smoke Developed: 50.

4. Density: Three lbs. per cubic foot, minimum.
5. Fittings: Molded fiberglass.
6. Jointing Materials: Manufacturers recommended adhesives and tape.
7. Valve Insulation: Miter cut nesting size covering segments of same thickness as pipeline, for insulation of valves.

B. Calcium Silicate Insulation at Insulation Protection Shields:
   1. Products and Manufacturers: Provide one of the following:
      a. Owens-Corning Fiberglass Corporation, Kaylo 10.
      b. Johns-Manville, Thermo 12.
      c. Or equal.
   2. Type: Calcium silicate pipe insulation.
   3. Fire Hazard Classification:
      a. Flame Spread: 0.
      b. Smoke Developed: 0.
   4. Density: Fourteen lbs. per cubic foot.
   5. Compressive Strength: 140 psi.
   6. Cut insulation 1/2-inch longer than insulation shield it rests on.

2.5 PAINTING

A. Piping, equipment and accessories shall be painted in accordance with Section 09 91 00, Painting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:
   1. Install all items as shown, specified, and as recommended by the manufacturer.
   2. Request instructions from ENGINEER, in writing, when there is a conflict between the manufacturer's recommendations and the Contract Documents.
   3. Present conflicts to ENGINEER, in writing, who will determine corrective measures to be taken.
   4. Do not modify structures to facilitate installation of piping, unless specifically approved by ENGINEER.
   5. Installation to conform to the requirements of all local and state codes.
   6. Properly plug or cap the open ends of all piping at the end of each day’s Work or other stopping point through construction. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

3.2 FIELD QUALITY CONTROL

A. Field Tests:
   1. Fill all systems and fully test all equipment, valves, etc. in operation.
   2. Check for excessive vibration while all systems are operating.
   3. Installed systems and components will not be released to OWNER unless all systems have been tested and approved by the ENGINEER.

B. Inspection:
   1. Examine areas to receive equipment, piping, valves and accessories for:
      a. Defects that adversely affect execution and quality of the Work.
      b. Deviations beyond allowable tolerances for equipment, piping, valves and accessories.
      c. Start the Work only when conditions are satisfactory.
   2. The ENGINEER reserves the right to reject or authorize replacement of equipment, piping, valves and accessories found to be defective, blistered, cracked or deviated from allowable tolerances as described above.

3.3 ADJUSTING AND CLEANING

A. Adjusting:
   1. Adjust all controls for proper settings.
   2. While system is operable, balance all equipment, valves, dampers, etc. to achieve design conditions.

B. Cleaning:
   1. Thoroughly clean all piping, fittings, valves, equipment and accessories prior to installation.
   2. Remove all dirt, rust, dust, etc. from piping and equipment in preparation for painting.
   3. Remove and dispose of all debris and waste from the Site resulting from installation.

3.4 MATERIAL SCHEDULES

A. Piping:
   1. All potable water supply, hot and cold 2-1/2-inches and smaller, run within the interior of a building, shall be hard-drawn copper Type “L” with solder joints and connections.
   2. All potable water piping 2-1/2-inches and smaller run underground shall be soft-annealed copper Type “K” copper tubing.
   3. All exposed water piping and valves to plumbing fixtures shall be chrome-plated brass.
   4. All valves for copper or brass piping shall be bronze bodied, unless otherwise specified.
   5. Use “wrought copper” fittings for copper tubing.

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SECTION 22 13 33

PACKAGED SUBMERSIBLE SEWERAGE PUMP UNITS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install packaged submersible sewerage pump units complete and operational with accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with or before packaged submersible sewerage pump units Work.

C. Related Sections:
   1. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ABMA.
   2. ANSI B16.1, Cast-Iron Pipe Flanges and Flanged Fittings.
   3. ANSI B73.1, Horizontal End Suction Centrifugal Pumps for Chemicals.
   4. ANSI/HI 1.3, Standard for Centrifugal Pumps for Design and Application.
   5. ANSI/HI 1.4, Standard for Centrifugal Pumps for Installation, Operation, and Maintenance.
   6. ANSI/HI 1.6, Centrifugal Pump Tests.
   7. ANSI/HI 9.6.2, Standard for Centrifugal and Vertical Pumps for Allowable Nozzle Loads.
   8. ANSI/HI 9.8, Pump Intake Design.
   9. ANSI/HI 11.6, Submersible Pump Tests.
   10. ASTM.
   11. IEEE 112, Test Procedure for Polyphase Induction Motors and Generators.
   12. NEMA MG-1, Motors and Generators.
   13. NFPA.
   14. UL 778, Motor-Operated Water Pumps.

1.3 QUALITY ASSURANCE

A. Manufacturer’s Qualifications:
   1. Manufacturer shall have at least five years experience producing substantially similar equipment to that required and shall be able to provide

documentation of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all equipment for each type of packaged submersible sewerage pump unit specified in this Section, regardless of the component manufacturer, from a single packaged submersible sump pump Supplier.
   2. Packaged submersible sewerage pump units Supplier shall review and approve or prepare all Shop Drawings and other submittals for all components provided under this Section.
   3. All components furnished shall be specifically constructed for the specified service and suitable for the specified service conditions, and shall be integrated into overall assembly by packaged submersible sewerage pump unit Supplier.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Detailed drawings of all wiring diagrams.
      b. Detailed installation drawing of each individual component showing: mounting requirements, location at Site, labeled and coded piping and wiring connections
      c. Schedule of equipment.
      d. Equipment data sheets.
   2. Product Data:
      a. Manufacturer's literature, illustrations, specifications, weight, dimensions, required clearances, materials of construction, and performance data for all equipment, and part lists for all components in sufficient detail for item-by-item comparison with the Contract Documents.
   3. Testing Plans, Procedures, and Testing Limitations:
      a. Provide pump Supplier's proposed shop testing plan, including complete list of testing facility limitations.
      b. Provide proposed field testing plan.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions:
      a. Setting drawings, templates, and directions for the installing anchor bolts and other anchorages.
      b. Instructions for handling and installing equipment.
   2. Source Quality Control Submittals:
      a. Results of shop tests for each complete pump system.
   3. Site Quality Control Submittals:
      a. Results of field tests for each complete pump system.
   4. Manufacturer's Reports:

a. Submit a written report of results of each visit to Site by pump Supplier, including purpose and time of visit, tasks performed, and results obtained.

C. Closeout Submittals: Provide the following:
   1. Operation and Maintenance Data:
      a. Submit operation and maintenance manuals including test reports, maintenance data, and schedules, description of operation, and spare parts information.
      b. Provide operation and maintenance manuals per Section 01 78 23, Operations and Maintenance Data.

D. Maintenance Material Submittals: Furnish the following:
   1. Spare Parts and Special Tools:
      a. All spare parts and tools recommended by manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Prior to shipping, completely inspect products to assure that components are complete and comply with all requirements. Box or crate products as required to prevent damage during shipment. Protect machined surfaces and matching connections to prevent damage.
   2. Deliver products to Site to ensure uninterrupted progress of the Work. Deliver anchorage products to be embedded in concrete in ample time to prevent delaying the Work.
   3. Inspect all boxes, crates, and packages upon delivery to Site and notify ENGINEER in writing of loss or damage to products. Promptly remedy loss and damage to new condition per manufacturer's instructions.
   4. Conform to Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
   1. Keep all products off ground using pallets, platforms, or other supports. Protect steel, packaged materials, and electronics from corrosion and deterioration.
   2. Conform to Section 01 66 00, Product Storage and Handling Requirements.

PART 2 - PRODUCTS

2.1 EQUIPMENT PERFORMANCE

A. Design Criteria:
   1. As shown in in the table below.

	Design Conditions	**Value**
a.	Type:	Simplex
b.	Quantity:	1

c.	Minimum Design Flow (gpm):	20
d.	TDH (ft) at Minimum Design Flow:	30
e.	Minimum Head at Zero Flow (ft):	35
f.	Maximum Motor, (HP):	0.5
g.	Drive Type:	Constant
h.	Electrical Service:	115 V, 1 Phase, 60 Hz

B. Equipment shall conform to ANSI/HI 1.3, ANSI/HI 9.8, and UL 778.

2.2 MANUFACTURERS OF CAST IRON SUMP PUMPS AND EJECTORS

A. Manufacturers: Provide products of one of the following:
   1. Weil Pump Company.
   2. Goulds Pump Company.
   3. Zoeller Pump Company.
   4. Or equal.

2.3 SUBMERSIBLE SUMP PUMPS

A. Type: Centrifugal, end-suction, single-stage non-clog, heavy duty sump pumps with motors and operating controls.

B. Material:
   1. Pump and Motor Housing: Cast iron.
   2. Impeller: Cast iron, non-clog, open type, statically and dynamically balanced, keyed to shaft and secured by locking setscrew.
   3. Fasteners: 18-8 stainless steel.
   4. Shaft: Stainless steel.
   5. Discharge: Flanged connection.
   6. Seals: Mechanical seals ceramic face with heat resistant stainless steel and Buna-N components.
   7. Cord: 18 AWG, SJTW.
   8. Float bracket: Stainless steel.

C. Motor:
   1. Motor Chamber: Submersible air-filled, hermetically sealed motor with Class F insulation.
   2. Built-in thermal overload protection.
   3. RPM: 1750.
   4. Motors shall be rated minimum 1/3 HP suitable for operation on a 115 volt, 1 phase 60 Hz supply

D. Non-mercury Float Switches:
   1. Provide integral vertical float switch.
   2. Materials:
      a. Support Pole: One-inch diameter Type 304 stainless steel pipe threaded one end.
      b. Support Bracket: Stainless steel.

c. Float Switch: Normally open non-mercury switches encapsulated in epoxy resin. Float casing shall be polypropylene. Provide snap-action type switch activated by steel ball rolling back and forth within switching tube in plastic float housing. Provide float switches by Anchor Scientific Inc. “Eco-Float”; Model G, Zoeller non-mercury float switches; or equal.

d. Switch Cable: Cable within sump Type SO neoprene jacket, four No. 18 conductor, 41 strand, 300-volt insulation. Cable between control panel and sump shall conform to requirements of Division 16, Electrical.

e. Cable Supports: Polypropylene composition clamp with stainless steel bolts.

f. High Liquid Level in Sump Alarm: Two conductors cable with color-coded cover.

E. Accessories:

1. Provide quick-removal system in sump specified in this Section.
2. Provide aluminum, factory-fabricated vented sump cover plate to accommodate pumps, quick removal system devices, level controls, power cabling, and piping furnished by sump pump Supplier.
   a. Sump cover plate shall be of sufficient thickness to support all components without flexure.
   b. Sump cover plate shall have gasketed, manhole-style cover, pump removal cover, and other required gastight penetrations.
3. Provide 15-foot standard length power cord with NEMA 5-15P plug.

2.4 SUBMERSIBLE PUMP QUICK-REMOVAL SYSTEM

A. Type: Provide as accessory allowing submersible pump or sewage ejector to be removed from the sump without disturbing piping or electrical connections. Quick-removal system shall be furnished by the pump Supplier and shall be compatible with the associated pumps or ejectors.

1. Stainless steel steel baseplate with stationary discharge fittings and spool support.
2. Two cast iron discharge elbows, one stationary (bolted to pump discharge flange) and one moveable.
3. Two stainless steel guide poles with connecting bars.
4. Stainless steel wire rope and complete fittings.
5. Rectangular hinged cover plate with drop handles and hinges.

2.5 VALVES

A. Iron Body Gate Valves:

1. Products and Manufacturers: Provide one of the following:
   a. Stockham Valves and Fittings, Fig. No. G-623.
   b. Lunkenheimer Company, Fig. No. 1430.
   c. Or equal.
2. Type: Rising stem, outside screw and yoke, solid wedge.

3. Materials: Iron with bronze trim.
4. Rating: 125 lb. SWP.
5. End Connections: Flanged, ANSI B16.1 drilling.

B. Iron Body Check Valves:
1. Products and Manufacturers: Provide one of the following:
a. Crane Valves, Fig. No. 383.
b. Nibco, Inc., Fig. No. 918.
c. Or equal.
2. Type: Swing, regrind-renew disc and seat ring, bolted cover with outside lever and weight.
3. Materials: Iron body, bronze trim, bronze disc and seat ring.
4. Rating: 125 lb. SWP.
5. End Connections: Flanged, ANSI B16.1 drilling, or threaded.

2.6 PAINTING

A. Prior to shipment from the factory, pumps, motors, drives, frames, baseplates, appurtenances shall receive manufacturer's standard paint system for the application specified.

B. Machined, polished, and non-ferrous surfaces shall be coated with corrosion prevention compound.

2.7 SOURCE QUALITY CONTROL

A. Equipment shall be completely manufactured and pre-assembled. Prior to shipping, perform the following tests and inspections at factory:
1. Test and inspect completed units for UL label.
2. Factory-test equipment to ensure that each entire sump pump or ejector package has been properly fabricated and assembled, that all controls function as specified, and that equipment meets specified performance requirements. Conduct tests per ANSI/HI 1.6 and ANSI/HI 11.6.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which products are to be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:

1. Install all products per the Contract Documents and as recommended by manufacturer. Do not modify structures to facilitate installation of pumps or ejectors, unless specifically approved by ENGINEER.
2. Conform to ANSI/HI 1.4.
3. Perform all fitting required for installation. Set products accurately in location, alignment, and elevation, plumb and true.
4. Provide utility connections per the Contract Documents. Support piping and valves independent of pump. Verify that utilities and valves are tested and operational before placing equipment into operation. When pumps are connected to piping with rigid hardware, connection of discharge nozzle to piping shall conform to ANSI/HI 9.6.2.
5. Align and adjust products and piping in presence of ENGINEER
6. Provide for initial operation lubricants recommended by equipment manufacturer
7. Prior to energizing motor driven equipment, rotate drive motor by an external source to demonstrate free operation of mechanical parts. Do not energize equipment until safety devices are installed, connected, and functional.

B. Field painting shall conform to Section 09 91 00, Painting.

3.3 FIELD TESTING / QUALITY CONTROL

A. All equipment will be given running tests by CONTRACTOR at the job Site following installation of the equipment and controls. Should the tests indicate any malfunction, CONTRACTOR shall make any necessary repairs and adjustments. Such tests and adjustments shall be repeated until, in the opinion of the ENGINEER, the installation is complete and the equipment is functioning properly and accurately, and is ready for permanent operation.

A. Field Tests:
1. Prior to placing sump pumps and ejectors into service, successfully test all related piping per the Contract Documents.
2. Fill all systems and test-operate all equipment and materials.
3. With Supplier's representative and ENGINEER, check equipment for excessive noise and vibration while systems are operating. Verify by measuring sump liquid level drawdown versus time the capacity of each pump provided. Correct defective Work until successful test results are obtained.

3.4 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. Provide a factory-trained representative for visits for the following activities:
1. Installation Supervision – 1 visit.
2. Field Testing – 1 visit.
3. Training – 1 Visit.

B. Each visit shall be a minimum of 8 hours on site, unless otherwise specified.

C. Representative shall revisit the Site as often as necessary until all trouble is corrected and the installation and operation are entirely satisfactory at no additional cost to the OWNER. All costs, including travel, lodging, meals and incidentals, for additional visits shall be at no additional cost to the OWNER.

D. The factory-trained representative shall provide the Supplier's Installation Certificate in accordance with Section 01 75 11, Checkout and Startup Procedures.

E. Provide operation and maintenance personnel training services in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.

3.5 ADJUSTING AND CLEANING

A. Adjusting:
   1. Adjust all controls for proper settings.
   2. While system is operating, balance and adjust all equipment and valves to achieve specified conditions.

B. Cleaning:
   1. Thoroughly clean all equipment and accessories prior to installation and prior to Substantial Completion.
   2. Remove all dirt, rust, dust, scale, and corrosion from products to receive field painting.
   3. Remove and dispose of all debris and waste from the Site resulting from installation.

+ + END OF SECTION + +

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC DUCTWORK, PIPING, AND EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install hangers and supports complete with required appurtenances for HVAC ductwork, piping, and equipment.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the hangers and supports for HVAC ductwork, piping, and equipment Work.

C. Related Sections:
   1. Section 03 60 00, Grouting.
   2. Section 05 05 33, Anchor Systems.
   3. Section 05 12 00, Structural Steel Framing.
   4. Section 05 50 13, Miscellaneous Metal Fabrications.

1.2 REFERENCES

A. American National Standards Institute (ANSI).
   1. ANSI B1.1 – Unified Inch Screw Threads (ASME B1.1).

B. American Society of Civil Engineers (ASCE).
   1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures.

C. American Society for Testing and Materials (ASTM).
   1. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.
   2. ASTM A47/A47M – Standard Specification for Ferritic Malleable Iron Castings.
   3. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   4. ASTM A153/A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   5. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
   6. ASTM A575 – Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
   7. ASTM A668/A688M – Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.

D. American Welding Society (AWS).
   1. AWS B2.1 – Specification for Welding Procedure and Performance Qualification.

E. Federal Specifications (FS).
   1. FS WW-H-171 – Hangers and Supports, Pipe.

F. Manufacturers Standardization Society (MSS).
   1. MSS SP 58 – Pipe Hangers and Supports-Materials, Design and Manufacture.
   2. MSS SP 69 – Pipe Hangers and Supports - Selection and Application.

G. National Fire Protection Association (NFPA).
   1. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems.

H. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
   1. HVAC Duct Construction Standards – Metal and Flexible.
   2. Seismic Restraint Manual: Guidelines for Mechanical Systems.
   3. Thermoset FRP Duct Construction Manual.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Minimum of five years of experience producing substantially similar equipment and able to show evidence of at least five installations in satisfactory operation for at least five years.
   2. Professional Engineer:
      a. Engage a registered professional engineer legally qualified to practice in New York State and experienced in providing engineering services of the kind indicated.
      b. Submit qualifications data.
      c. Responsibilities include but are not necessarily limited to:
         1) Carefully reviewing system performance and design criteria stated in the Contract Documents.
         2) Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to Engineer by Contractor.
         3) Preparing or supervising the preparation of design calculations and related drawings, Shop Drawings, testing plan development, test-result interpretation and a comprehensive engineering analysis verifying compliance of the system with the requirements of the Contract Documents.
         4) Signing and sealing all calculations and design drawings, and Shop Drawings.
         5) Certifying that:
            a) it has performed the design of the system in accordance with the performance and design criteria stated in the Contract Documents, and

b) the said design conforms to all applicable local, state and federal codes, rules and regulations, and to the prevailing standards of practice.

3. Installer:
   a. Engage an experienced installer to perform the work of this Section who has specialized in installing hangers and supports for HVAC ductwork, piping, and equipment similar to that required for this Project and who is acceptable to manufacturer.
   b. Submit name and qualifications to Engineer along with the following information on a minimum of three successful projects:
      1) Names and telephone numbers of owners, architects or engineers responsible for projects.
      2) Approximate contract cost of the hangers and supports for HVAC ductwork, piping, and equipment.
      3) Amount of area installed.
4. Welding:
   a. Qualify processes and operators in accordance with AWS B2.1 as appropriate for material to be welded.
   b. Provide certification that operators employed on or to be employed for the Work have satisfactorily passed AWS qualification tests within previous 12 months. Ensure that all certifications are current.

B. Component Supply and Compatibility:
1. Obtain all equipment included in this Section regardless of the component manufacturer from a single hangers and supports for HVAC ductwork, piping, and equipment manufacturer.
2. Require the hangers and supports for HVAC ductwork, piping, and equipment manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall equipment assembly by the hangers and supports for HVAC ductwork, piping, and equipment manufacturer.

C. Regulatory Requirements:
1. International Building Code (IBC).
2. National Fire Protection Association (NFPA).
3. Local and State Building Codes and Ordinances.
4. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
1. Shop Drawings:
   a. Drawings showing fabrication methods, assembly, accessories, and installation details.
   b. Setting drawings, templates, and directions for the installation of anchor bolts and other anchorages.

c. Drawings showing floor supported components and installation arrangement.

2. Product Data:
   a. Manufacturer's literature, illustrations, specifications, weight, dimensions, required clearances, materials of construction, and performance data for all equipment.
   b. Complete component list.
   c. Detailed description of each component.
   d. Catalog cut sheets for each component.
   e. Deviations from Contract Documents. Any exceptions to the Contract Documents must be clearly defined. Contractor shall be responsible for any additional expenses that may occur due to any exception made.
   f. Other technical data related to specified material and equipment as requested by Engineer.
3. Delegated Design Submittals:
   a. 1/4-inch scale HVAC ductwork, piping, and equipment layouts, dimensioned to show length of runs, with all expansion joints, alignment guides, anchors and appurtenances required for proper control of HVAC ductwork, piping, and equipment forces. The drawings shall include all forces acting on the HVAC ductwork, piping, and equipment and the corresponding reactions of the compensation and anchor devices provided.
   b. All drawings, design calculations, and a letter indicating that the hanger and support systems have been properly designed shall be signed and sealed by a registered professional engineer legally qualified to practice in New York State.

B. Informational Submittals: Submit the following:
1. Certificates:
   a. Independent certification reports.
2. Manufacturer Instructions:
   a. Instructions and recommendations for handling, storing, protecting the equipment.
   b. Installation Data.
3. Source Quality Control Submittals:
   a. Factory test reports.
4. Qualifications Statements:
   a. Manufacturer, when requested by Engineer.
   b. Professional Engineer, when requested by Engineer.
   c. Installer, when requested by Engineer.
   d. Welding, when requested by Engineer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
1. Deliver materials to the Site to ensure uninterrupted progress of the Work.
2. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of that Work.
3. Comply with manufacturer's recommendations for rigging of equipment.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Criteria:
   1. Designs generally accepted as exemplifying good engineering practice and using stock or production parts shall be utilized wherever possible.
   2. Accurate weight balance calculations shall be made to determine the required force at each hanger and support location and the weight load at each force concentration point.
   3. Hangers and supports shall be capable of supporting and restraining HVAC ductwork, piping, and equipment in all conditions of operation. They shall allow free expansion and contraction, and prevent excessive stress resulting from transferred weight being induced into the HVAC ductwork, piping, and equipment.
   4. Hangers and supports shall be designed so that they cannot become disengaged by movements of the supported HVAC ductwork, piping, and equipment.
   5. Rod length shall be limited to a maximum length of eight linear feet.
   6. HVAC ductwork, piping, and equipment that cannot be hung by rod and hanger arrangement shall be floor or wall supported.
   7. All structural components shall be designed based on static and dynamic loads imposed by the supported HVAC ductwork, piping, and equipment and shall include a safety factor of 2 for the yield strength. Minimum angle sizes shall be 2-inch x 2-inch x1/4-inch.
   8. Load ratings, materials and installation shall be consistent with the recommendations from the latest edition of MSS SP 58, MSS SP 69, and FS WW-H-171.
   9. Hanger and support design calculations for all HVAC ductwork, piping, and equipment shall be signed and sealed by a registered professional engineer legally qualified to practice in the State of New York.

2.2 MANUFACTURERS

A. Manufacturer: Provide product of one of the following:
   1. Erico International Corporation.
   2. Anvil International.
   3. Or equal.

2.3 DETAILS OF CONSTRUCTION

A. Materials:
   1. Hangers, supports, restraints, and appurtenances located in corrosive areas shall be Type 316 stainless steel.
   2. Hangers, supports, restraints, and appurtenances located in non-corrosive or dusty areas shall be hot dipped galvanized steel in accordance with ASTM A123/A123M and ASTM A153/A153M.
   3. Hangers, supports, restraints, and appurtenances located outdoors shall be Type 316 stainless steel.
   4. Steel used for the support of uninsulated copper piping or plastic piping shall be PVC coated.

B. Components of hangers and supports shall conform to the following:
   1. Bolts: ASTM A307, Grade A, unless otherwise specified below.
   2. Forgings: ASTM A668/A688M.
   3. Malleable Iron: ASTM A47/A47M.
   4. Rods and Bars: ASTM A575.
   5. Threads: Unified Screw Threads, Class 2A and 2B, ANSI B1.1.
   6. Structural Steel: ASTM A36/A36M.

C. Hanger Attachments: The following types of attachments shall be considered acceptable:
   1. Adjustable Steel Clevis: FS WW-H-171E, Type 1.
   2. Steel Double Bolt Pipe Clamp: FS WW-H-171E, Type 3.
   3. Steel Pipe Clamp: FS WW-H-171E, Type 4.
   4. Adjustable Swivel Pipe Ring: FS WW-H-171E, Type 6.
   5. Adjustable Steel Band Hanger: FS WW-H-171E, Type 7.
   6. Riser Clamp: FS WW-H-171E, Type 8.
   7. Light-Duty Clevis Hanger: FS WW-H-171E, Type 12.
   8. Long Clips: FS WW-H-171E, Type 26.
   9. Offset J-Hooks: FS WW-H-171E, Type 27.
   10. Steel Pipe Covering Protection Saddle: FS WW-H-171E, Type 40A.
   11. Insulation Protection Shield: FS WW-H-171E, Type 41.
   12. Pipe Saddle Support: FS WW-H-171E, Type 37.
   13. Pipe Stanchion Saddle: FS WW-H-171E, Type 38.
   14. Pipe Saddle Support with Base: FS WW-H-171E, Type 36.
   15. Adjustable Roller Hanger: FS WW-H-171E, Type 42.

D. Structural Attachments: The following types of attachments shall be considered acceptable:

1. Side Beam Clamp: FS WW-H-171E, Type 20.
2. Center I-Beam Clamp: FS WW-H-171E, Type 21.
3. Welded Steel Bracket: FS WW-H-171E, Types 32 and 33.
4. Side Beam Bracket: FS WW-H-171E, Type 35.

E. Hanger Rod Attachments: Use as required to complete assembly:
1. Forged Steel Clevis: FS WW-H-171E, Type 14.
2. Adjustable Turnbuckle: FS WW-H-171E, Type 15.
3. Forged Steel Welders Eye Nut: FS WW-H-171E, Type 17.

F. Concrete anchorage shall be provided in accordance with Section 05 05 33, Anchor Systems.

G. Structural steel shall be provided in accordance with Section 05 12 00, Structural Steel Framing.

H. Miscellaneous metal fabrications shall be provided in accordance with Section 05 50 13, Miscellaneous Metal Fabrications.

2.4 SOURCE QUALITY CONTROL

A. Shop Tests:
1. Equipment shall be completely manufactured and pre-assembled in accordance with Reference Standards. Perform the following tests and inspections at factory before shipment:
a. Tested and inspected for approval as a unit by Underwriters Laboratories Inc., UL Label or equal.
b. Factory test equipment to ensure that the entire package has been properly fabricated and assembled, that the package meets the specified performance requirements including manufacturer's data report.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials and equipment will be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

B. Take field measurements where required prior to installation to ensure proper fitting of Work.

3.2 INSTALLATION

A. General:
1. Install the equipment in accordance with the Contract Documents and by manufacturer's instructions and recommendations. Obtain written

interpretation from Engineer in the event of conflict between manufacturer's instructions and recommendations and the Contract Documents.
2. Install in accordance with Laws and Regulations.
3. Do not modify structures to facilitate installation of equipment, unless approved in writing by Engineer.
4. Installation to conform to requirements of all local and state codes.

B. Ductwork:
1. The construction and installation of hangers and supports for ductwork shall conform to the recommendations given in the SMACNA HVAC Duct Construction Standards except as specified.
2. Hanger rods shall have threaded ends.
3. All ductwork shall be supported from trapeze type hangers. No sheet metal duct hangers or straps will be allowed.
4. A pair of rods shall be provided at each duct support point.
5. For nonmetal ductwork, there shall be not less than a 1/4-inch buildup of FRP over the duct at each support. Each support shall be furnished with a 1/8-inch thick Teflon sheet to shield the duct from the support.

C. Piping:
1. Insulated pipes with vapor barriers shall have an insulation protection shield conforming to FS WW-H-171E, Type 41 tack-welded to hanger.
2. Insulated pipes without vapor barriers shall have a steel protection saddle conforming to FS WW-H-171E, Type 40A.
3. All uninsulated copper piping shall be supported by plastic coated steel pipe attachments.
4. All piping shall be braced as required, to prevent sway in any direction.
5. All insulated piping 3-inch diameter and larger shall be supported by roller hangers conforming to FS WW-H-171E, Type 42.
6. Additional supports shall be placed immediately adjacent to any change in direction.
7. Supports for Vertical Piping:
   a. Provide riser clamp placed under hub, fitting or coupling with approved solid bearing on steel sleeve at each floor level.
   b. Where riser clamps are used with plastic piping they shall be modified so as not to exert any compressive forces on the pipe.
   c. Support spacing shall not exceed code requirements.
8. Allow clearances for expansion and contraction of piping.

D. Anchorages and Base Plates:
1. Provide anchorages in new or existing concrete, as applicable, in accordance with equipment manufacturer's recommendations and the Contract Documents. Install anchors in accordance with Section 05 05 33, Anchor Systems.
2. Where used, pour concrete bases up to one inch below equipment baseplate or support leg as applicable. Base with equipment mounted shall then be accurately shimmed to grade and spaces between filled with non-shrink grout in accordance with Section 03 60 00, Grouting. After grout has reached its initial set, exposed edges shall be neatly cut back 1/2 inch.

3.3 ADJUSTING

A. Adjust all equipment for proper settings.

3.4 CLEANING

A. Thoroughly clean all equipment and accessories prior to installation.

B. Remove all dirt, rust, dust, etc. from equipment and accessories after installation.

C. Remove and dispose of all debris and waste from the Site resulting from installation.

3.5 SCHEDULES

A. Hangers and Supports for Ductwork:
   1. Spacing:
      a. Ductwork shall be supported at distances not exceeding the spacing specified below:
         1) Metal Ductwork:
            a) Maximum Spacing: 10 feet.
         2) Flexible and Other Factory-Made Ductwork (such as FRP):
            a) Maximum Spacing: In accordance with the manufacturer's installation instructions.
   2. Hanger Rod Sizes:
      a. Hanger rods shall be sized based on static and dynamic loads imposed by the supported ductwork and shall include a safety factor of 2 for the yield strength.
      b. Rod load shall not exceed rod manufacturer's recommended capacity.

B. Hangers and Supports for Piping:
   1. Spacing:
      a. Piping shall be supported at distances not exceeding the spacing specified below or in accordance with MSS SP 58:
         1) Copper Tube:
            a) Maximum Horizontal Spacing: 6 feet.
            b) Maximum Vertical Spacing: 10 feet.
         2) Copper Pipe:
            a) Maximum Horizontal Spacing: 12 feet.
            b) Maximum Vertical Spacing: 10 feet.
         3) Steel Pipe:
            a) Maximum Horizontal Spacing: 12 feet.
            b) Maximum Vertical Spacing: 15 feet.
   2. Hanger Rod Sizes:
      a. Hanger rods shall be sized based on static and dynamic loads imposed by the supported piping and shall include a safety factor of 2 for the yield strength.
      b. Rod load shall not exceed rod manufacturer's recommended capacity.

C. Hangers and Supports for HVAC Equipment:
   1. Provide spacing and hanger rod sizes in accordance with equipment manufacturer's installation instructions.

+ + END OF SECTION + +

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified, and required to perform the testing, adjusting, and balancing for HVAC as specified herein.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the testing, adjusting, and balancing for HVAC Work.

C. Related Sections:
   1. Section 10 14 00, Signage.

1.2 REFERENCES

A. Associated Air Balance Council (AABC).
   1. AABC National Standards for Total System Balance.

B. American National Standards Institute/American Industrial Hygiene Association (ANSI/AIHA).
   1. ANSI/AIHA Z9.5 – Laboratory Ventilation.

C. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).
   1. ASHRAE Handbook – Fundamentals.

D. National Environmental Balancing Bureau (NEBB).
   1. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.

E. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
   1. SMACNA HVAC Systems – Testing, Adjusting & Balancing Handbook.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Balancer:

a. Engage an experienced balancer to perform the work of this Section who has specialized in testing, adjusting, and balancing for HVAC systems similar to that required for this Project.
b. Minimum of five years of experience in testing, adjusting, and balancing substantially similar equipment and able to show evidence of at least five installations in satisfactory operation for at least five years.
c. Submit name and qualifications to Engineer along with the following information on a minimum of five successful projects:
    1) Names and telephone numbers of owners, architects or engineers responsible for projects.
    2) Approximate contract cost of the testing, adjusting, and balancing for HVAC Work.
    3) Amount of area tested, adjusted, and balanced.
    4) Biographical information on employee proposed to directly supervise the testing, adjusting, and balancing Work.

B. Regulatory Requirements:
1. Associated Air Balance Council (AABC).
2. National Electrical Code (NEC).
3. National Environmental Balancing Bureau (NEBB).
4. National Fire Protection Association (NFPA).
5. Underwriters Laboratories Inc. (UL).
6. Local and State Building Codes and Ordinances.
7. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
1. Product Data:
    a. Data sheets with name of devices, manufacturer's name, model number, latest date of calibration, and correction factors for each testing, adjusting, and balancing instruments.
    b. Other technical data related to specified material and equipment as requested by Engineer.

B. Informational Submittals: Submit the following:
1. Certificates:
    a. Certification by National Environmental Balancing Bureau (NEBB), Association Air Balance Council (AABC), or equal.
2. Source Quality Control Submittals:
    a. Specimen copies of report forms for Engineer's review and approval.
        1) Forms shall be 8-1/2 by 11-inch paper for loose-leaf binding, with blanks for certification of report and listing all required testing, adjusting, and balancing requirements and ratings.

3. Field Quality Control Submittals:
    a. Written startup and field test reports presenting results of required field testing, adjusting, and balancing.
        1) Certified reports shall be in typed format on approved forms imprinted with the company's name.
        2) Reports shall include procedure outline used to test, adjust, and balance the systems and the types of instruments used.
        3) Minimum three certified copies of testing, adjusting, and balancing reports to the Engineer for review.
        4) Reports must be submitted to Engineer and Owner for approval prior to Owner's acceptance for responsibility.
4. Qualifications Statements:
    a. Balancer, when requested by Engineer.

C. Closeout Submittals: Submit the following:
1. Maintenance Contracts:
    a. Maintenance and Repair:
        1) Provide all labor, tools, and equipment to provide a Preventive Maintenance Program and make repairs for all equipment and controls during the One Year Correction Period after the Final Acceptance by Owner. Contractor shall provide the following services for the same period of one year:
            a) Receive calls for all problems and take steps to immediately correct deficiencies, which may exist.
            b) Provide a monthly inspection of all equipment, and record the findings on a checklist hereinafter specified.
            c) Provide a Preventive Maintenance Schedule for the principle items of equipment.
            d) Respond to Owner and make repairs for all equipment and controls within 24-hours of notification by Owner.
    b. Check List:
        1) Provide a checklist and post a copy of it, where directed by the Owner.
        2) Include each piece of equipment specified or shown.
        3) Provide four columns for required quarterly inspections.
        4) Provide columns for the following:
            a) Equipment condition.
            b) Equipment operation.
            c) Equipment lubrication.
            d) Preventive maintenance.
        5) Preventive maintenance shall be performed in accordance with the manufacturer's recommendations and accepted practice.
2. Operations and Maintenance Data:

a. Submit complete Installation, Operation and Maintenance Manuals, including, test reports, maintenance data and schedules, description of operation, and spare parts information.
b. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 23, Operations and Maintenance Data.

1.5 SITE CONDITIONS

A. Environmental Requirements:
1. Testing, adjusting, and balancing for HVAC shall be performed when outside ambient conditions are approximate to the local ASHRAE Handbook – Fundamentals design conditions for all heating and cooling functions.

PART 2 - PRODUCTS

2.1 EQUIPMENT PERFORMANCE

A. Equipment Description:
1. Air Balance Instruments:
a. Provide all velometers, anemometers, pitot tubes, differential air pressure gages, manometers, hook gages, static pressure probe units, and all other instruments and accessories as required to perform all air balance tests of HVAC equipment, ducts, registers, grilles, etc.
b. Flow-measuring hoods (manufactured, not fabricated) shall be acceptable for measurement of ceiling diffuser performance only.
2. System Performance Measuring Instruments:
a. Provide insertion thermometers, sling psychrometers, tachometers, revolution counters, clamp-on volt-ammeter recorders, and other instruments as required to measure all facets of the complete HVAC system performance.

B. Performance Criteria:
1. Instrumentation shall be in accordance with NEBB, AABC, or SMACNA requirements and shall be calibrated to the accuracy standards demanded by these organizations.

2.2 ACCESSORIES

A. Balancing Sheaves and Belts:
1. Balancing sheaves and belts shall be provided for all belt driven equipment.
2. Sheaves and belts shall be provided to match construction and duty provided by the equipment manufacturer.
3. Equipment sheaves and belts replaced or not required to achieve balancing shall be submitted to the Owner as spare parts.

2.3 IDENTIFICATION

A. All equipment and component identification, including valve tags, shall be provided in accordance with Section 10 14 00, Signage.

PART 3 - EXECUTION

3.1 INSPECTION

A. Heating, ventilating and air conditioning equipment and components shall be completely installed and in continuous operation, as required, to accomplish the testing, adjusting and balancing Work specified.

B. Inspect all HVAC equipment and components for proper operation prior to testing, adjusting and balancing.
   1. Fan Belt Deflection: Not less than 1/4-inch or more than 1/2-inch.

C. Pre-Startup Inspection:
   1. Verify proper equipment mounting and setting.
   2. Verify that control, interlock and power wiring is complete.
   3. Verify alignment of motors and drives.
   4. Verify proper piping connections and accessories.
   5. Verify that lubrication is completed.

D. First Run Observations:
   1. Verify direction of rotation.
   2. Verify setting of safety controls.
   3. Monitor heat build-up in bearings.
   4. Check motor loads against nameplate data.

E. Equipment Check:
   1. Verify proper overload heater sizes.
   2. Verify function of safety and operating controls.
   3. Verify proper operation of equipment.
   4. Report on inspection, observation and checking procedures.

F. Promptly report defects which may affect the Work to Engineer.

G. Should corrective measures caused by faulty installation require re-testing, adjusting and balancing, such Work shall be at no additional cost to the Owner.

3.2 APPLICATION

A. General:

1. Test, adjust, and balance all systems, ductwork, piping, etc. and their control systems in accordance with the AABC National Standards for Total System Balance, NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems, SMACNA HVAC Systems - Testing, Adjusting & Balancing Handbook, or in compliance with the standard procedure manual published by the testing, adjusting, and balancing organization affiliated with Contractor. Contractor shall submit one copy of the standard procedure manual to the Engineer for their records.
2. Contractor shall provide all necessary instruments, tools, ladders, etc. to complete all testing, adjusting, and balancing Work.
3. Contractor shall assume full responsibility for safe keeping of all instruments, tools, ladders, etc. during the course of the Work.
4. Contractor shall be solely responsible for the protection and safeguarding of the Work and shall provide every protection against accidents, injury, and damage to persons and property.
5. Contractor shall keep dust, dirt, and debris to an absolute minimum and reinstall all removed ceiling components to their original positions at the end of each day's Work.
6. Contractor shall be fully responsible for removal and reinstallation of ceiling system and replacement of any component damaged.
7. Contractor shall install additional access panels at no extra cost to the Owner, as is required to gain access to equipment concealed above ceilings, behind walls, or any other concealed space.
8. Systems shall be tested, adjusted, and balanced with clean filters and strainers.
9. Where equipment is provided with a variable speed controller (VSC) or variable frequency drive (VFD), balance the equipment first with the VSC or VFD and then with balancing dampers (air systems) or valves (hydronic systems). All systems shall be optimized through the VSC or VFD by balancing with the minimum static pressure needed to meet design flow conditions.

B. Air Systems:
   1. Preliminary:
      a. Identify and list size, type and manufacturer of all equipment to be tested, including air terminals.
   2. Central Systems:
      a. Test rpm for all equipment, including adjusting of each fan, air handling unit, and air conditioning unit to design requirements within the limits of mechanical equipment provided.
      b. Test and record motor voltages and running amperes including motor nameplate data, and starter heater ratings for each unit as listed above.
      c. Make pitot tube traverse of main supply, exhaust and return ducts, determine airflow at all fans and units and adjust fans and units to within five percent of design requirements.

d. Test and record system static pressure, suction and discharge.
e. Test and adjust system for design outside air, (cfm).
f. Test and adjust system for design recirculated air, (cfm).
g. Test and record heating apparatus entering air temperatures, (dry bulb).
h. Test and record cooling apparatus entering air temperatures, (dry bulb and wet bulb).
i. Test and record heating apparatus leaving air temperatures, (dry bulb).
j. Test and record cooling apparatus leaving air temperatures, (dry bulb and wet bulb).
k. Record all fan and air handling unit speeds.
l. Record air quantity delivered by each fan and air-handling unit.

3. Distribution:
   a. Sheave and belt replacement shall be provided as the first means of accomplishing the balancing Work before volume dampers are adjusted from their initial open positions.
   b. Adjust volume dampers, control dampers, splitter dampers, etc., to proper design airflow in main ducts, branch ducts, and zones.
4. Air Terminals:
   a. Identify each air terminal as to location and determine required flow reading.
   b. Test and adjust each air terminal to within tolerance of design requirements as listed below.
      1) Positive Zones:
         a) Diffusers and Supply Air Terminals: 0 percent to +10 percent.
         b) Exhaust and Return Air Terminals: 0 percent to -10 percent.
      2) Negative Zones:
         a) Diffusers and Supply Air Terminals: 0 percent to -10 percent.
         b) Exhaust and Return Air Terminals: 0 percent to +10 percent.
      3) Neutral Zones:
         a) All Air Terminals: -10 percent to +10 percent.
   c. Test procedure on air terminals shall include recording comparison of required airflow and observed airflow, adjustment of terminal, and recording of final airflow.
   d. Adjust flow patterns from air terminal units to minimize drafts to the extent that the design and equipment permits.
5. Verification:
   a. Prepare summation of readings of observed airflow for each system, compare with required airflow, and verify that duct losses are within specified allowable range.
   b. Verify design airflow at fans as described above.
   c. If determined that the air system has not been properly balanced, Contractor shall rebalance and recheck all equipment and components in the presence of the Engineer and as accepted by the Engineer.

3.3 SCHEDULES

A. Test, adjust, and balance all HVAC equipment.

+ + END OF SECTION + +

SECTION 23 31 13

METAL DUCTWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install metal ductwork complete and operational with accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the metal ductwork Work.

C. Related Sections:
   1. Section 10 14 00, Signage.
   2. Section 23 05 29, Hangers and Supports for HVAC Ductwork, Piping, and Equipment.
   3. Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

1.2 REFERENCES

A. Air Movement and Control Association International, Inc. (AMCA).
   1. AMCA Standard 500-D – Laboratory Methods of Testing Dampers for Rating.
   2. AMCA Publication 511 – Certified Ratings Program - Product Rating Manual for Air Control Devices.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).
   1. ASHRAE Standard 52.2 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

C. American Society for Testing and Materials (ASTM).
   1. ASTM E84 – Standard Test Method for Burning Characteristics of Building Materials.
   2. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   3. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

D. American Welding Society (AWS).
   1. AWS B2.1 – Specification for Welding Procedure and Performance Qualification.

E. National Bureau of Standard's Voluntary Product Standard.
   1. NBS PS 15-69 – Standard for Contact-Molded Reinforced Polyester Chemical Resistant Process Equipment.

F. National Fire Protection Association (NFPA).
   1. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems.
   2. NFPA 90B – Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
   3. NFPA 701 – Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

G. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
   1. Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems.
   2. HVAC Duct Construction Standards – Metal and Flexible.
   3. Round Industrial Duct Construction Standards.
   4. Rectangular Industrial Duct Construction Standards.

H. Underwriters Laboratories Inc. (UL).
   1. UL 181 – Factory-Made Air Ducts and Air Connectors.
   2. UL 181A – Closure Systems for Use With Rigid Air Ducts.
   3. UL 181B – Closure Systems for Use With Flexible Air Ducts and Air Connectors.
   4. UL 555 – Fire Dampers.
   5. UL 555S – Smoke Dampers.
   6. UL 900 – Air Filter Units.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Minimum of five years of experience producing substantially similar equipment and able to show evidence of at least five installations in satisfactory operation for at least five years.
   2. Installer:
      a. Engage an experienced installer to perform the work of this Section who has specialized in installing metal ductwork similar to that required for this Project and who is acceptable to manufacturer.
      b. Submit name and qualifications to Engineer along with the following information on a minimum of three successful projects:
         1) Names and telephone numbers of owners, architects or engineers responsible for projects.
         2) Approximate contract cost of the metal ductwork.
         3) Amount of area installed.
   3. Welding:
      a. Qualify processes and operators in accordance with AWS B2.1 as appropriate for material to be welded.

b. Provide certification that operators employed on or to be employed for the Work have satisfactorily passed AWS qualification tests within previous 12 months. Ensure that all certifications are current.

B. Regulatory Requirements:
1. National Electrical Code (NEC).
2. National Fire Protection Association (NFPA).
3. Underwriters Laboratories Inc. (UL).
4. Local and State Building Codes and Ordinances.
5. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
1. Shop Drawings:
a. Drawings showing fabrication methods, assembly, accessories, and installation details.
b. 1/4-inch scale duct layouts, dimensioned to show length of runs, sizes, support spacing and expansion provisions.
c. Detailed installation drawing of each individual component showing:
1) Mounting requirements.
2) Locations.
d. Setting drawings, templates, and directions for the installation of anchor bolts and other anchorages.
2. Product Data:
a. Manufacturer's literature, illustrations, specifications, weight, wall thicknesses, design pressures, dimensions, required clearances, materials of construction, and performance data for all equipment.
b. Complete component list.
c. Detailed description of each component.
d. Catalog cut sheets for each component.
e. Deviations from Contract Documents. Any exceptions to the Contract Documents must be clearly defined. Contractor shall be responsible for any additional expenses that may occur due to any exception made.
f. Other technical data related to specified material and equipment as requested by Engineer.

B. Informational Submittals: Submit the following:
1. Certificates:
a. Certification that all stainless steel ductwork, accessories, and hardware are of the Type specified.
2. Manufacturer Instructions:
a. Instructions and recommendations for handling, storing, protecting the equipment.
b. Installation Data.
3. Source Quality Control Submittals:
a. Factory test reports.
4. Field Quality Control Submittals:

a. Written report presenting results of required field testing.

5. Supplier Reports:
   a. Submit written report of results of each visit to Site by Supplier's service personnel, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
6. Qualifications Statements:
   a. Manufacturer, when requested by Engineer.
   b. Installer, when requested by Engineer.
   c. Welding, when requested by Engineer.

C. Closeout Submittals: Submit the following:
1. Record Documentation:
   a. During progress of the Work keep an up-to-date set of the Drawings showing field and Shop Drawing modifications. Immediately upon completion of the Work, submit "pdf" of CADD drawings showing the actual in place installation of all ductwork and equipment installed under this Section at a scale satisfactory to the Owner. The drawings shall show all ductwork on plans and in sections, with all reference dimensions and elevations required for complete Record Drawings of the systems. Two paper prints shall also be furnished. The prints and electronic copies of the CADD files shall be furnished no later than 30 days after completion of the Contract and prior to final payment.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
1. Deliver materials to the Site to ensure uninterrupted progress of the Work.
2. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of that Work.
3. Comply with manufacturer's recommendations for rigging of equipment.

B. Storage and Protection:
1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:
1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.6 SITE CONDITIONS

A. Existing Conditions:
   1. The Contract Documents show the general arrangement and extent of the Work to be done. The exact location and arrangement of all parts shall be determined as the Work progresses. The exact location of all parts of the Work is governed by the general building plans and the actual building conditions.
   2. The Drawings are intended as an indication of the arrangement of equipment and ductwork and are as nearly correct as can be determined in advance of the actual construction of the Work. Equipment, ductwork, and appurtenances found to interfere with the construction of the building, plumbing apparatus and piping, electrical wiring or other obstructions, etc., must be changed in location to clear such obstructions.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. System Description:
   1. The Drawings show the general arrangement of all systems. Should local conditions necessitate rearrangement of the systems, Contractor, before proceeding with the Work, shall prepare and submit complete drawings showing all details of the proposed rearrangement for written approval.
   2. The connections shown to the various units are intended as an indication only. The actual connections at the time of installation to be made and arranged to suit the requirements of each case and adequately provide for expansion and minimize the amount of space required for the same.
   3. The Drawings do not show all offsets, fittings, accessories and details, which may be required. Contractor shall carefully examine all of the General Construction, Electrical, Mechanical, Structural and other Drawings and the respective Specifications for conditions which may affect the installation of the Work, and shall arrange the Work accordingly, furnishing all required items to meet such conditions which are not specified as work “by others,” to complete the systems to the true extent of the Contract Documents.

B. Design Criteria:
   1. All sheet metal construction shall be in accordance with the construction details and installation details in the latest edition of the SMACNA HVAC Duct Construction Standards. This Standard is hereinafter referred to as HVAC DS.
   2. Sheet metal construction shall conform to the following minimum pressure classification (positive and negative pressure), unless otherwise shown or specified:

      a. Ductwork serving process spaces: 2-inch W.G.

2.2 DETAILS OF MATERIALS

A. Material Type:
   1. Aluminum ductwork shall be Alloy 3003 – H-14 in accordance with ASTM B209.
      a. All accessories for aluminum ductwork shall be aluminum, unless noted otherwise.
   2. Stainless steel ductwork shall be Type 316.
      a. All accessories for stainless steel ductwork shall be Type 316 stainless steel, unless noted otherwise.
      b. Welded stainless steel ductwork shall be Type 316L.

B. Duct construction alternatives (duct gauge in relation to reinforcement spacing) selected by Contractor from HVAC DS Tables shall be identified by duct system and shall be submitted in schedule form to the Engineer prior to beginning installation of ductwork. Contractor shall construct ductwork to meet the requirements of the HVAC DS Tables in conjunction with the minimum duct thickness schedules in Article 3.10 below.

C. Thickness of aluminum ductwork and size and thickness of aluminum supports shall be appropriately converted using the aluminum conversion tables in the HVAC DS.

D. Rectangular ductwork longitudinal seams shall be Pittsburgh Lock type with permanently elastomeric sealant applied continuously within the seam.

E. Round ductwork seams shall be spiral lock seam except for laboratory exhaust systems which shall be solid wall welded longitudinal seams.

F. Duct reinforcement shall be made using external stiffener angles. Tie rods shall not be acceptable. Stiffener angles shall be constructed of the same material as the ductwork.

G. Transverse Joints:
   1. Manufacturer: Provide product of one of the following:
      a. Ductmate Industries, Inc.
      b. Elgen Manufacturing Company, Inc.
      c. Or equal.
   2. Ductwork shall be connected by a mechanical joining system, except where otherwise noted.
   3. Manufacturer's installation instructions will be followed, except where otherwise noted.
   4. SMACNA T-24 and other flange type connectors formed from the duct edge will NOT be allowed.
   5. All connectors shall meet or exceed the functional criteria outlined in the HVAC DS and shall be constructed of the same material as the ductwork.

H. Turning Vanes:
   1. Manufacturer: Provide product of one of the following:

a. Ductmate Industries, Inc.
b. Elgen Manufacturing Company, Inc.
c. C.L. Ward & Family, Inc.
d. Or equal.

2. Material: Same material as ductwork.
3. Ducts 24-inches or shorter:
   a. Vanes: Single thickness.
   b. Runners: Type 2.
4. Ducts taller than 24-inches:
   a. Vanes: Double thickness.
   b. Runners: Type 1.

I. Splitter Dampers:
1. Reference: HVAC DS.
2. Material: Same material as ductwork.

J. Transitions and Offsets:
1. Reference: HVAC DS.
2. Material: Same material as ductwork.

K. Branch Take-Offs:
1. Reference: HVAC DS.
2. Material: Same material as ductwork.
3. 45 degrees, NO straight taps, unless specifically shown.

L. Rectangular Square Throat Elbows:
1. Reference: HVAC DS.
2. Material: Same material as ductwork.
3. Provided with turning vanes.

M. Rectangular Radius Elbows and Round Elbows:
1. Reference: HVAC DS.
2. Material: Same material as ductwork.
3. Centerline Radius: R=1.5W, unless specifically shown otherwise.

N. Round Converging Flow Fittings:
1. Converging flow fittings shall be constructed with a radius entrance to all branch taps and with no excess material projecting from the body into the branch tap entrance.
2. Branch entrances shall be by means of factory-fabricated fittings or factory fabricated duct tap assemblies.

O. Seal Class:
1. Class A – Ductwork constructed with a minimum pressure classification (positive and negative pressure) of 4-inch W.G. and up.
2. Class B – Ductwork constructed with a minimum pressure classification (positive and negative pressure) less than 4-inch W.G.

P. Leakage:
   1. Zero percent – Laboratory exhaust systems.
   2. Not to exceed five percent – All other systems.

Q. Flexible duct or duct constructed of fiberglass duct board shall not be permitted, except where specifically shown or indicated.

2.3 ACCESSORIES

A. Hangers and Supports:
   1. Hangers and supports shall be provided in accordance with Section 23 05 29, Hangers and Supports for HVAC Ductwork, Piping, and Equipment.

B. Motorized Control Dampers and Volume Dampers (for Rectangular Ductwork):
   1. Commercial Type Dampers for Aluminum Ductwork:
      a. Design and Performance Criteria (based on 48-inch damper width):
         1) Dampers shall be performance rated and certified in accordance with AMCA Standard 500-D and AMCA Publication 511.
         2) Maximum Design Total Static Pressure: 5.2-inch W.G.
         3) Damper Leakage: Class 1 Leakage Rated – Not more than 8 cfm per square foot at 4-inch W.G. with blade seals.
         4) Certification: Manufacturer shall submit certified test data.
      b. Product and Manufacturer: Provide one of the following:
         1) Model CD50, as manufactured by Ruskin.
         2) Model VCD-40, as manufactured by Greenheck Fan Corporation.
         3) Or equal.
      c. Details of Construction:
         1) Material: 6063-T5 aluminum.
         2) Frame: 0.125-inch thick hat channel with mounting flanges.
         3) Single Section Sizes:
            a) Minimum: 6-inch wide by 9-inch high.
            b) Maximum: 60-inch wide by 72-inch high.
         4) Blades:
            a) 6-inch wide.
            b) Opposed blades.
            c) Airfoil shape with heavy gauge 6063-T5 aluminum double skin construction.
            d) EPDM edge seals for motorized control dampers only.
         5) Linkage: Concealed in frame outside the air stream.
         6) Axles: 1/2-inch plated steel hex.
         7) Bearings: Molded synthetic.
         8) Jamb Seals: Flexible metal compressible type.
         9) Provide Type 304 stainless steel outside handle, quadrant with 2-inch standoff and approved position indicator with locking device for all volume dampers.
   2. Commercial/Industrial Type Dampers for all Metal Ductwork:
      a. Design and Performance Criteria (based on 48-inch damper width):

1) Dampers shall be performance rated and certified in accordance with AMCA Standard 500-D and AMCA Publication 511.
2) Maximum Design Total Static Pressure: 17.0-inch W.G.
3) Damper Leakage: Class 1 Leakage Rated – Not more than 8 cfm per square foot at 4-inch W.G. with blade seals.
4) Certification: Manufacturer shall submit certified test data.

b. Product and Manufacturer: Provide one of the following:
1) Model CD80AF2, as manufactured by Ruskin.
2) Model HCD-330, as manufactured by Greenheck Fan Corporation.
3) Or equal.

c. Details of Construction:
1) Material: Same as ductwork.
2) Frame: Minimum 14 gauge channel frame with mounting flanges.
3) Single Section Sizes:
a) Minimum: 6-inch wide by 12-inch high.
b) Maximum: 60-inch wide by 96-inch high.
4) Blades:
a) 6-inch wide.
b) Opposed blades.
c) Minimum 16 gauge double skin airfoil shape construction with material same as ductwork.
d) EPDM edge seals for motorized control dampers only.
5) Linkage: Concealed in frame outside the air stream.
6) Axles: Minimum 3/4-inch with material same as ductwork.
7) Bearings: Stainless steel sleeve.
8) Jamb Seals: Stainless steel compressible type.
9) Provide outside handle, quadrant with 2-inch standoff and approved position indicator with locking device constructed from same material as ductwork for all volume dampers.

C. Motorized Control Dampers and Volume Dampers (for Round Ductwork):
1. Commercial Type Dampers for all Metal Ductwork:
a. Design and Performance Criteria (based on 48-inch damper diameter):
1) Dampers shall be performance rated and certified in accordance with AMCA Standard 500-D and AMCA Publication 511.
2) Maximum Design Total Static Pressure: 4.0-inch W.G.
3) Damper Leakage: Not more than 11.30 cfm total at 1-inch W.G. with blade seals.
4) Certification: Manufacturer shall submit certified test data.

b. Product and Manufacturer: Provide one of the following:
1) Model CDRS82, as manufactured by Ruskin.
2) Or equal.

c. Details of Construction:
1) Material: Same as ductwork.
2) Frame: Minimum 16 gauge frame with 12 gauge mounting flanges.
3) Single Section Sizes:
a) Minimum: 4-inch diameter.
b) Maximum: 48-inch diameter.

4) Blades:
   a) Minimum 16 gauge double skin construction with material same as ductwork.
   b) EPDM continuous edge seals with pin angle stops for motorized control dampers only.
5) Axles: Minimum 1/2-inch with material same as ductwork.
6) Bearings: Stainless steel sleeve.
7) Provide outside handle, quadrant with 2-inch standoff and approved position indicator with locking device constructed from same material as ductwork for all volume dampers.

D. Access Doors:
1. Provide access doors for all fire and smoke dampers, control dampers, and other duct mounted devices where required to be accessible.
2. Access doors for fire and smoke dampers shall not affect the integrity of fire-resistance-rated assemblies. The access openings shall not reduce the fire-resistance rating of the assembly.
3. Access doors for fire and smoke dampers shall be labeled "FIRE/SMOKE DAMPER ACCESS", "SMOKE DAMPER ACCESS", or "FIRE DAMPER ACCESS" with minimum 1/2-inch high letters.
4. Reference: HVAC DS.
5. Material: Same as ductwork.
6. For Rectangular Ductwork:
   a. Type: Gasketed cam lock covers.
   b. Unless otherwise specified rectangular access doors shall be:
      1) 12 by X-2-inches for ducts X-inches and smaller less than 14-inches.
      2) 24 by 12-inches for ducts between 14 and 36-inches.
      3) 24 by 24-inches for ducts between 36 and 60-inches.
      4) Two 24 by 24-inch doors for ducts larger than 61-inches.
7. For Round Ductwork:
   a. Type: Industrial oval gasketed access door with locking hand wheels.
   b. Unless otherwise specified oval access door sizes shall be:

Duct Diameter:	Nominal Opening:
8 thru 18-inches:	10 by 6-inches.
19 thru 48-inches:	16 by 12-inches.
49 thru 72-inches:	24 by 18-inches.

E. Flexible Connectors (FC):
1. Design and Performance Criteria:
   a. Flexible connectors shall be tested in accordance with UL 181.
   b. Flexible connectors shall be listed and labeled as Class 0 or Class 1 flexible connectors.
   c. Flexible connectors shall meet NFPA 90A, NFPA 90B, NFPA 701, and local building codes.
   d. Maximum Design Total Static Pressure: 10.0-inch W.G.
   e. Temperature Range: -65 degrees F to 500 degrees F.
   f. Width: Minimum 4 inches, but shall not exceed 14 inches.
2. Product and Manufacturer: Provide one of the following:

a. Model Thermafab, as manufactured by Duro Dyne Corporation.
b. Model PROflex, as manufactured by Ductmate Industries, Inc.
c. Or equal.

3. Details of Construction:
   a. Base Fabric: Woven fiberglass.
   b. Coating: Silicone rubber.
   c. Weight: 17 ounce per square yard.
   d. Tensile Strength: 200 lb by 250 lb.
   e. Tear Strength: 50 lb by 40 lb.
   f. Features:
      1) Excellent high temp resistance.
      2) Excellent low temp resistance.
      3) Excellent chemical resistance.
      4) Excellent low smoke emission.
      5) Excellent ozone resistance.
      6) Excellent weathering.
      7) Unaffected by mildew.
   g. Metal connectors shall be of the same material and gauge as ductwork with double-lock fold.

F. Miscellaneous Duct Fittings:
   1. Reference: HVAC DS.
   2. Material: Same material as ductwork.

G. Sleeves:
   1. Material: Same material as ductwork passing through opening.
   2. Thickness: Minimum 24-gauge.
   3. Calk airtight with fire resistant sealant between sleeve and ductwork.

H. Duct Gaskets:
   1. Product and Manufacturer: Provide one of the following:
      a. Model 440 Gasket Tape, as manufactured by Ductmate Industries, Inc.
      b. Model 440 Butyl Gasket, as manufactured by Elgen Manufacturing Company, Inc.
      c. Or equal.
   2. Material: Non-hardening butyl.
   3. Service Temperatures: -30 degrees F to 180 degrees F.
   4. Service Life: 20 years minimum.
   5. Gaskets shall have the following Fire Hazard Classifications in accordance with ASTM E84:
      a. Flame Spread: 10 maximum.
      b. Smoke Developed: 10 maximum.

I. Hardware and Fasteners:
   1. All hardware and fasteners for aluminum and stainless steel ductwork shall be Type 316 stainless steel, unless noted otherwise.
   2. All hardware and fasteners for galvanized ductwork shall be G90 hot dipped galvanized steel, unless noted otherwise.

J. Grilles and Diffusers:
   1. General:
      a. Grilles and diffusers mounted in hung ceilings shall have a baked enamel white finish.
      b. Aluminum grilles and diffusers not mounted in hung ceilings shall have a clear anodized finish.
      c. Stainless steel grilles and diffusers shall have a satin polish [mill] finish except where white polyvinylidene fluoride (PVDF) coating is specified on the Equipment Schedule.
      d. Where registers are shown to be provided in lieu of grilles, include an integral opposed blade damper of the same construction as the grille.
   2. Supply Grilles (SG):
      a. Product and Manufacturer: Provide one of the following:
         1) Aluminum construction:
            a) Model X20, as manufactured by Anemostat.
            b) Model A54, as manufactured by Tuttle & Bailey.
            c) Model 300FL, as manufactured by Titus.
            d) Or equal.
         2) Type 316 stainless steel construction:
            a) Model SS2, as manufactured by Anemostat.
            b) Model T54SS, as manufactured by Tuttle & Bailey.
            c) Model 300RL-SS, as manufactured by Titus.
            d) Or equal.
      b. Double deflection with horizontal face bars for horizontal duct and vertical face bars for vertical duct.
      c. 3/4-inch blade spacing.
      d. For surface mounting as shown or indicated on Drawings.
   3. Return/Exhaust Grilles (RG/EG):
      a. Product and Manufacturer: Provide one of the following:
         1) Aluminum construction:
            a) Model X30, as manufactured by Anemostat.
            b) Model A70, as manufactured by Tuttle & Bailey.
            c) Model FL, as manufactured by Titus.
            d) Or equal.
         2) Type 316 stainless steel construction:
            a) Model SS3, as manufactured by Anemostat.
            b) Model T70SS, as manufactured by Tuttle & Bailey.
            c) Model RL-SS, as manufactured by Titus.
            d) Or equal.
      b. Single 0- or 45-degree deflection with horizontal face bars for horizontal duct and vertical face bars for vertical duct.
      c. 3/4-inch blade spacing.
      d. For surface mounting as shown or indicated on Drawings.

K. Wire Mesh Screens:
   1. Wire mesh screens shall be provided where shown or specified on the Drawings.

2. Material:
    a. Type 304 stainless steel mesh and frame for aluminum ductwork.
    b. Type 316 stainless steel mesh and frame for stainless steel ductwork.
3. Mesh Size: 3/4-inch by 3/4-inch interwoven with 0.135-inch (10 gauge) diameter wire.

2.4 IDENTIFICATION

A. All equipment and component identification shall be provided in accordance with Section 10 14 00, Signage.

2.5 SOURCE QUALITY CONTROL

A. Shop Tests:
    1. Equipment shall be completely manufactured and pre-assembled in accordance with Reference Standards. Perform the following tests and inspections at factory before shipment:
        a. Tested and inspected for approval as a unit by Underwriters Laboratories Inc., UL Label or equal.
        b. Factory test equipment to ensure that the entire package has been properly fabricated and assembled, that all the controls function as specified herein and that the package meets the specified performance requirements including manufacturer's data report.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials and equipment will be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

B. Take field measurements where required prior to installation to ensure proper fitting of Work.

3.2 PREPARATION

A. Protection of Surrounding Areas/Surfaces:
    1. Openings and penetrations shall be capped to protect the building from outside conditions.
    2. Properly cap the open ends of all ductwork at the end of each day's Work or other stopping point throughout the construction. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

3.3 INSTALLATION

A. General:
   1. Install the equipment in accordance with the Contract Documents and by manufacturer's instructions and recommendations. Obtain written interpretation from Engineer in the event of conflict between manufacturer's instructions and recommendations and the Contract Documents.
   2. Install in accordance with Laws and Regulations.
   3. Do not modify structures to facilitate installation of equipment, unless approved in writing by Engineer.
   4. Installation to conform to requirements of all local and state codes.

B. All ductwork shall conform accurately to the dimensions shown, the ducts shall be straight and smooth inside with joints neatly finished. Ductwork shall be installed so as to preclude the possibility of vibration under all operating conditions.

C. Tape and seal all joints in accordance with HVAC DS. Tape shall not be used as the primary means of sealing. Tape used in sealing metallic ductwork shall be listed and labeled in accordance with UL 181A and shall be marked "181 A-P" for pressure-sensitive tape, "181 A-M" for mastic or "181 A-H" for heat-sensitive tape. Tape used in sealing flexible ductwork and connectors shall be listed and labeled in accordance with UL 181B and shall be marked "181 B-FX" for pressure-sensitive tape or "181 B-M" for mastic.

D. Fire dampers shall be provided and installed where indicated and where required by UL and authorities having jurisdiction, and shall be approved by local building codes and in accordance with the requirements of the NFPA.

E. Install all ductwork and accessories to provide a system free from buckling, warping, bellowing, or vibration.

F. All ducts at flexible connections with fans shall be supported at free end within 12-inches of flexible connection.

G. Provisions shall be made for supporting all ductwork, dampers, and other ductwork accessories, where necessary.

H. Coordinate all air outlets for compatibility with ceiling system.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Services:
   1. Provide a qualified, factory-trained service person to perform the following:
      a. Instruct Contractor in installing equipment.
      b. After installation, inspect and adjust equipment, verify proper operation, and assist with field testing.
      c. Instruct operations and maintenance personnel in operation and maintenance of the equipment.
   2. Manufacturer's service person shall make visits to the Site as follows:

a. First visit shall be for instructing Contractor in proper equipment installation, and assisting in installing equipment. Minimum number of hours on-Site: 8 hours.
b. Second visit shall be for checking completed installation, start-up of system; and performing field testing. Minimum number of hours on-Site: 8 hours.
c. Third visit shall be to instruct operations and maintenance personnel.
    1) Furnish services of manufacturer's qualified, factory-trained specialists to instruct operations and maintenance personnel in recommended operation and maintenance of equipment.
    2) Training requirements, duration of instruction, and qualifications shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
    3) Number of hours on-Site shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
d. Technician shall revisit the Site as often as necessary until installation is acceptable.

3. All costs, including expenses for travel, lodging, meals and incidentals, and cost of travel time, for visits to the Site shall be included in the Contract Price.

3.5 ADJUSTING

A. All duct systems shall be tested, adjusted, and balanced per Section 23 05 93, Testing, Adjusting, and Balancing for HVAC.

B. Test openings shall be installed in the ductwork as directed by the testing, adjusting, and balancing Contractor. Test openings shall be sealed by a screw cap and gasket.

3.6 CLEANING

A. Thoroughly clean all ductwork and accessories prior to installation.

B. Remove all dirt, rust, dust, etc. from ductwork and accessories after installation.

C. Remove and dispose of all debris and waste from the Site resulting from installation.

3.7 SCHEDULES

A. Minimum Duct Thicknesses:
    1. One gauge thicker than recommended in the HVAC DS for the same pressure classification, reinforcement and support spacing.

B. All ductwork and plenums serving the following equipment shall be stainless steel:
    1. Weaver:
        a. SF-1
        b. SF-2

C. Ductwork materials not specified above or on the Drawings shall be constructed of Type 316 SS unless otherwise directed by Engineer.

+ + END OF SECTION + +

SECTION 23 34 05

METALLIC HVAC FANS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install metallic HVAC fans complete and operational with accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the metallic HVAC fans Work.

C. Related Sections:
   1. Section 10 14 00, Signage.
   2. Section 23 05 29, Hangers and Supports for HVAC Ductwork, Piping, and Equipment.
   3. Section 26 05 05, General Provisions for Electrical Systems.
   4. Section 26 05 53, Identification For Electrical Systems.
   5. Section 26 28 16.33, Disconnect Switches.
   6. Section 40 05 93, Common Motor Requirements for Process Equipment.

1.2 REFERENCES

A. Air Movement and Control Association International, Inc. (AMCA).
   1. AMCA Standard 99-0401 – Classification for Spark Resistant Construction.
   2. AMCA Standard 99-2408 – Operating Limits for Centrifugal Fans.
   3. AMCA Standard 204 – Balance Quality and Vibration Levels for Fans.
   4. AMCA Standard 210 – Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.
   5. AMCA Standard 300 – Reverberant Room Method for Sound Testing of Fans.
   6. AMCA Standard 301 – Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

B. American Bearing Manufacturers Association (ABMA).
   1. ABMA 9 – Load Ratings and Fatigue Life for Ball Bearings.
   2. ABMA 11 – Load Ratings and Fatigue Life for Roller Bearings.

C. American Society for Testing and Materials (ASTM).
   1. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.

D. Institute of Electrical and Electronic Engineers (IEEE).

E. National Electrical Code (NEC).

F. National Fire Protection Association (NFPA).
   1. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems.
   2. NFPA 91 – Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids.

G. Underwriters Laboratories Inc. (UL).
   1. UL 705 – Power Ventilators.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Minimum of five years of experience producing substantially similar equipment and able to show evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single metallic HVAC fan manufacturer.
   2. Require the metallic HVAC fan manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall equipment assembly by the metallic HVAC fan manufacturer.

C. Regulatory Requirements:
   1. National Electrical Code (NEC).
   2. National Fire Protection Association (NFPA).
   3. Underwriters Laboratories Inc. (UL).
   4. Local and State Building Codes and Ordinances.
   5. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

D. Certifications:
   1. Metallic HVAC fans shall bear an approved label with all the necessary identification marks, electrical data, and any necessary cautions as required by the National Electric Code.
   2. Metallic HVAC fans shall be AMCA certified.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings showing fabrication methods, assembly, accessories, installation details, and wiring diagrams.
      b. Setting drawings, templates, and directions for the installation of roof/equipment curbs, anchor bolts, and other anchorages.

2. Product Data:
    a. Manufacturer's literature, illustrations, specifications, weight, dimensions, required clearances, materials of construction, and performance data for all equipment.
    b. Complete component list.
    c. Detailed description of each component.
    d. Catalog cut sheets for each component.
    e. Fan performance curves with operating points.
    f. Standard and custom color selection charts for finishing system.
    g. Lubricant Specification: Furnish lubricant specification for type and grade required for equipment furnished.
    h. Deviations from Contract Documents. Any exceptions to the Contract Documents must be clearly defined. Contractor shall be responsible for any additional expenses that may occur due to any exception made.
    i. Other technical data related to specified material and equipment as requested by Engineer.
3. Testing Plans, Procedures, and Testing Limitations:
    a. Plan for performing required shop testing.
    b. Plan for performing required field testing.

B. Informational Submittals: Submit the following:
1. Certificates:
    a. Certification of painting systems, in accordance with "Finishing" Article in this Section.
    b. Independent certification reports:
        1) UL Label or equal.
        2) AMCA certification.
2. Manufacturer Instructions:
    a. Instructions and recommendations for handling, storing, protecting the equipment.
    b. Installation Data.
    c. Instructions for handling, start-up, and troubleshooting.
3. Source Quality Control Submittals:
    a. Written report presenting results of required shop testing.
    b. Factory test reports.
4. Field Quality Control Submittals:
    a. Written report presenting results of required field testing.
5. Supplier Reports:
    a. Submit written report of results of each visit to Site by Supplier's service personnel, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
6. Qualifications Statements:
    a. Manufacturer, when requested by Engineer.

C. Closeout Submittals: Submit the following:
1. Maintenance Contracts:

a. Service shall be provided by a factory-trained and certified equipment manufacturer's representative during the One Year Correction Period. The equipment manufacturer's representative shall maintain all equipment furnished under this Section during the first year of operation.
b. Service provided shall include the following:
1) Quarterly On-Site Service: Service intervals shall be quarterly for a minimum of one day of eight hours each quarter. The service duration shall be increased, as necessary by the equipment manufacturer's representative, taking into consideration the equipment service requirements and equipment size. Equipment manufacturer's representative shall indicate the service duration and service scope. Prior to the visits, the equipment manufacturer's representative shall contact the Owner and inquire as to problems encountered with the equipment. Service visits shall be scheduled at times agreeable to the Owner at least one week in advance. The quarterly service shall include, but not limited to the following:
a) Provide manufacturer's recommended maintenance.
b) Check all controls and components, and recalibrate or adjust as necessary.
c) Perform necessary cleaning and services that are scheduled on a quarterly basis in accordance with the approved Operations and Maintenance Manuals. Provide all expendable materials, as necessary.
d) Review and provide recommendations concerning Owner's operations.
e) Replace or repair defective controls and components.
f) Inspect control panels. Test control panel's indication lights and replace defective lights.
g) Provide a detailed field report to the Owner.
2) Technical Support: Technical support shall be provided between the hours of 8:00 AM and 4:00 PM local standard time, Monday through Friday when requested by the Owner. Technical support shall include, but not limited to the following:
a) Telephone Technical Support.
b) On-Site Visits: If resolution of a problem is not achieved via the Telephone Technical Support, an on-site visit and field report shall be required.

2. Operations and Maintenance Data:
a. Submit complete Installation, Operation and Maintenance Manuals, including, test reports, maintenance data and schedules, description of operation, and spare parts information.
b. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 23, Operations and Maintenance Data.
3. Warranty Documentation:
a. General warranty.
b. Special warranties on materials and equipment.

D. Maintenance Material Submittals: Furnish the following:

1. Spare Parts:
    a. Spare parts list and recommended quantities.
    b. One set of bearings for each belt drive fan.
    c. One drive shaft for each belt drive fan.
    d. One set of belts for each belt drive fan.
2. Extra Stock Materials:
    a. Touch up paint for each unit.
3. Tools:
    a. Two sets of special tools, if any, required for normal operation and maintenance.
4. Spare parts, extra stock materials, and tools shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the Owner at the conclusion of the Project.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
    1. Deliver materials to the Site to ensure uninterrupted progress of the Work.
    2. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of that Work.
    3. Comply with manufacturer's recommendations for rigging of equipment.

B. Storage and Protection:
    1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
    2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:
    1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive Owner of other rights or remedies Owner may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under the Contract Documents. The obligations of Contractor under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.

B. Special Warranty on Materials and Equipment:

1. Provide manufacturer's written warranty, running to the benefit of Owner, agreeing to correct, or at option of Owner, remove or replace materials or equipment specified in this Section found to be defective during a period of 1 year after the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EQUIPMENT PERFORMANCE

A. Design Criteria:
   1. Design conditions shall be as indicated on the Equipment Schedule.
   2. Fans shall conform and be certified to UL 705.
   3. Fan bearings shall be rated for a minimum L-10 life of 100,000 hours at the fan's maximum operating speed in accordance with ABMA 9 or 11.
   4. Fans shall be balanced in accordance with AMCA Standard 204.

B. Performance Criteria:
   1. Minimum performance data for each unit shall be as indicated on the Equipment Schedule. Provided equipment shall not exceed scheduled total power.
   2. Fans shall be performance rated in accordance with AMCA Standards 210, 300, and 301.

2.2 DETAILS OF EQUIPMENT

A. Axial Fans
   1. Product and Manufacturer: Provide one of the following:
      a. Model A39, as manufactured by Hartzell.
      b. Or equal.
   2. Housing:
      a. Minimum 12-gauge continuously welded aluminum construction with 1-1/2 inch welded inlet and outlet flanges.
      b. Inspection door shall be provided for access to the fan wheel.
      c. Drive components shall be isolated for the airstream with a removable bearing cover and aerodynamic welded belt tunnel for belt drive units.
      d. Mounting brackets shall be welded to the outer housing to accommodate universal mounting feet for vertical or horizontal installation.
      e. Type 304 stainless steel fasteners.
   3. Propeller:
      a. Airfoil designed.
      b. Multiple bladed
      c. Cast aluminum.
      d. Propeller shall be retained on motor shaft utilizing split taper bushing.
      e. Adjustable pitch.

B. Fan Motors
   1. Motors shall be premium efficiency, totally enclosed fan cooled (TEFC) type. Where TEFC motors are not available from the manufacturer, provide open

drip proof (ODP) type with a letter from the manufacturer stating TEFC is not available.
2. Motors shall have a service factor of 1.15.
3. Motors shall be normal starting torque, normal slip, squirrel cage induction type. VFD driven motors shall be compatible for variable frequency drive operation and suitable to be applied in speed varying service without overheating.
4. Motors shall be of sufficient size so that there will be no overload on the motor above rated nameplate horsepower under any condition of operation imposed by the driven equipment.
5. Motors shall have Class F insulation with Class B temperature rise and be capable of carrying nameplate full load current plus service factor continuously without an injurious temperature rise in an ambient temperature of 40 degrees C.
6. Motor thrust bearings shall be adequate to carry continuous thrust loads under all conditions of operation imposed by the driven equipment.
7. Motors shall be in accordance with all current applicable standards of NEMA, IEEE, ABMA, NEC, and ANSI.
8. Locked rotor currents shall be as specified in NEMA Standards.
9. Provide lubrication of non-hygroscopic grease or oil type.
10. Provide automatic breather and drain for TEFC motor enclosures.
11. Provide integral overload protection on all single phase motors.
12. Provide severe duty type motors rated for chemical atmospheres where specified on the Equipment Schedule.

C. Belts and Drives
1. Fans shall be belt drive with adjustable sheaves or direct drive as shown on the Equipment Schedule.
2. Belts shall be oil and heat resistant, non-static type.
3. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized with a minimum 1.5 service factor of the installed motor horsepower.

2.3 ACCESSORIES

A. Structural Supports
1. Contractor shall provide and install all hangers, rods, supports, bolts, nuts, washers, inserts, and appurtenances as required to mount equipment where shown. All hangers, rods, supports, bolts, nuts, washers, inserts, and appurtenances shall conform to Section 23 05 29, Hangers and Supports for HVAC Ductwork, Piping, and Equipment.

B. Differential Pressure Switch
1. Product and Manufacturer: Provide one of the following:
a. Dwyer 1950G, as manufactured by Dwyer.
b. Neobits.
c. Or equal.
2. Vertical Plane Mounting.
3. NEMA 7 enclosure rating appropriate for Class 1 Div 1 environments.

4. Pressure range of each differential pressure switch shall be selected to match the corresponding duct system.
5. Pressure set point shall be field adjustable.

2.4 FINISHING

A. All surfaces shall be prepared, and coating systems applied and cured in strict accordance with the coating manufacturer's approved procedures. Primer coatings shall be selected for the specific material and application.

B. Primer coat and finish coat dry film thickness shall be applied to the required thickness as recommended by the coating manufacturer to provide maximum corrosion protection.

C. The equipment manufacturer shall furnish a written affidavit that the equipment has been prepared, primed, and coated in strict accordance with the coating manufacturer's procedures and at the coating manufacturer's facility.

D. All gears, bearing surfaces, machined surfaces, and other surfaces that are to remain unpainted shall receive a heavy application of grease or other rust-resistant coating. Maintain coating during shipping and storage until equipment is placed into operation.

2.5 CONTROLS

A. Sequence of Operations:
   1. Weaver Pump Station
      a. Supply Fan (WVR-SF-1)
         1) SF shall be controlled by an ON/OFF switch, provided by Electrical, set to run continuously.

2.6 IDENTIFICATION

A. All equipment and component identification shall be provided in accordance with Section 10 14 00, Signage.

B. All electrical wiring identification shall be provided in accordance with Section 26 05 53, Identification For Electrical Systems.

C. All electrical wiring shall be color-coded and labeled for simplified identification. Power wiring shall be coded per Owner standards.

2.7 SOURCE QUALITY CONTROL

A. Shop Tests:
   1. Fan Tests:
      a. Except as described below or otherwise approved by Engineer, test one fan of each size in accordance with AMCA Standard 210. Tests are not required for standard fans for which data on previously tested units of

equal design is available. Curves and other test data from units previously tested shall be submitted with shop test results prior to shipping equipment.

b. Test each fan for minimum three hours run-time, at the manufacturer's plant with the job or test motor. Vibration and temperature measurements shall be taken to determine its mechanical integrity. Vibration level shall be limited to a maximum of 1.25 mils. Temperature of bearing housing near the end of run time shall not exceed 215 degrees F under artificially created ambient temperature of 104 degrees F.

c. Each test shall be witnessed by a registered professional engineer, who may be an employee of fan manufacturer. The professional engineer shall certify that the required tests were performed, and sign and seal the results. Jurisdiction of professional engineer's registration, registration number, and name shall be on the seal. Equipment serial number shall also appear on test data for the fan.

2. Equipment shall be completely manufactured and pre-assembled in accordance with Reference Standards. Perform the following tests and inspections at factory before shipment:
   a. Tested and inspected for approval as a unit by Underwriters Laboratories Inc., UL Label or equal.
   b. Factory test equipment to ensure that the entire package has been properly fabricated and assembled, that all the controls function as specified herein and that the package meets the specified performance requirements including manufacturer's data report.
   c. Fan wheels and shafts shall be statically and dynamically balanced.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials and equipment will be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

B. Take field measurements where required prior to installation to ensure proper fitting of Work.

3.2 PREPARATION

A. Protection of Surrounding Areas/Surfaces:
   1. Openings and penetrations shall be capped to protect the building from outside conditions.
   2. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

3.3 INSTALLATION

A. General:
   1. Install the equipment in accordance with the Contract Documents and by manufacturer's instructions and recommendations. Obtain written interpretation from Engineer in the event of conflict between manufacturer's instructions and recommendations and the Contract Documents.
   2. Install in accordance with Laws and Regulations.
   3. Do not modify structures to facilitate installation of equipment, unless approved in writing by Engineer.
   4. Installation to conform to requirements of all local and state codes.
   5. Curb mounted fans shall be provided with enough electrical wiring and conduit slack to allow the fan to be removed from the curb without disconnecting the electrical wiring at the fan.

B. Differential Pressure Switch
   1. To be installed in the dry well ductwork after the supply fan and before any air terminals. Units shall be calibrated to detect airflow and to send a signal when air flow is not detected. Coordinate with Instrumentation and Controls.

3.4 FIELD QUALITY CONTROL

A. Field Tests:
   1. After equipment installation is complete, Contractor and a qualified field service representative of unit manufacturer shall perform an operating test and a sound test of each unit and associated controls, in presence of Engineer. Equipment will pass the test when each unit and its controls are demonstrated to function correctly, and sound levels do not exceed maximum limits.
   2. Running Tests:
      a. Field-test each equipment together with its controls and appurtenances. Tests shall demonstrate to Engineer that each part and all parts together function in accordance with the Contract Documents. Provide all necessary testing equipment, labor, and appurtenances.
      b. Verify that equipment operates at design point as intended, that vibration limits are not excessive and beyond manufacturer's recommendations, and that equipment operates smoothly without excessive noise, temperature rise, or other defects, across entire range of operating curve. Verify that all controls work as intended in both manual and automatic mode. Successfully test-operate each equipment for at least (--1--) hours.
      c. If equipment does not comply with the Contract Documents and does not pass the tests, Contractor shall adjust, modify, and retest the equipment as often as necessary until tests are successfully passed.

B. Manufacturer's Services:
   1. Provide a qualified, factory-trained service person to perform the following:
      a. Instruct Contractor in installing equipment.
      b. After installation, inspect and adjust equipment, verify proper operation, and assist with field testing.
      c. Instruct operations and maintenance personnel in operation and maintenance of the equipment.
   2. Manufacturer's service person shall make visits to the Site as follows:

a. First visit shall be for instructing Contractor in proper equipment installation, and assisting in installing equipment. Minimum number of hours on-Site: 8 hours.
b. Second visit shall be for checking completed installation, start-up of system; and performing field testing. Minimum number of hours on-Site: 8 hours.
c. Third visit shall be to instruct operations and maintenance personnel.
    1) Furnish services of manufacturer's qualified, factory-trained specialists to instruct operations and maintenance personnel in recommended operation and maintenance of equipment.
    2) Training requirements, duration of instruction, and qualifications shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
    3) Number of hours on-Site shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
d. Technician shall revisit the Site as often as necessary until installation is acceptable.

3. All costs, including expenses for travel, lodging, meals and incidentals, and cost of travel time, for visits to the Site shall be included in the Contract Price.

3.5 ADJUSTING

A. Adjust all controls for proper settings.

B. While system is operable, balance all equipment to achieve design conditions.

3.6 CLEANING

A. Thoroughly clean all equipment and accessories prior to installation.

B. Remove all dirt, rust, dust, etc. from equipment and accessories after installation.

C. Remove and dispose of all debris and waste from the Site resulting from installation.

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SECTION 23 34 06

NON-METALLIC HVAC FANS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install non-metallic HVAC fans complete and operational with accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the non-metallic HVAC fans Work.

C. Related Sections:
   1. Section 10 14 00, Signage.
   2. Section 23 05 29, Hangers and Supports for HVAC Ductwork, Piping, and Equipment.
   3. Section 26 05 05, General Provisions for Electrical Systems.
   4. Section 26 05 53, Identification For Electrical Systems.
   5. Section 26 28 16.33, Disconnect Switches.

1.2 REFERENCES

A. Air Movement and Control Association International, Inc. (AMCA).
   1. AMCA Standard 204 – Balance Quality and Vibration Levels for Fans.
   2. AMCA Standard 210 – Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.
   3. AMCA Standard 300 – Reverberant Room Method for Sound Testing of Fans.
   4. AMCA Standard 301 – Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

B. American Bearing Manufacturers Association (ABMA).
   1. ABMA 9 – Load Ratings and Fatigue Life for Ball Bearings.
   2. ABMA 11 – Load Ratings and Fatigue Life for Roller Bearings.

C. American Society for Testing and Materials (ASTM).
   1. ASTM E84 – Standard Test Method for Burning Characteristics of Building Materials.
   2. ASTM D4167 – Standard Specification for Fiber-Reinforced Plastic Fans and Blowers.

D. National Electrical Code (NEC).

E. National Fire Protection Association (NFPA).

1. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems.
2. NFPA 91 – Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids.

F. Underwriters Laboratories Inc. (UL).

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Minimum of five years of experience producing substantially similar equipment and able to show evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single non-metallic HVAC fan manufacturer.
   2. Require the non-metallic HVAC fan manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall equipment assembly by the non-metallic HVAC fan manufacturer.

C. Regulatory Requirements:
   1. National Electrical Code (NEC).
   2. National Fire Protection Association (NFPA).
   3. Underwriters Laboratories Inc. (UL).
   4. Local and State Building Codes and Ordinances.
   5. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

D. Certifications:
   1. Non-metallic HVAC fans shall bear an approved label with all the necessary identification marks, electrical data, and any necessary cautions as required by the National Electric Code.
   2. Non-metallic HVAC fans shall be AMCA certified.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings showing fabrication methods, assembly, accessories, installation details, and wiring diagrams.
      b. Setting drawings, templates, and directions for the installation of roof/equipment curbs, anchor bolts, and other anchorages.
   2. Product Data:

a. Manufacturer's literature, illustrations, specifications, weight, dimensions, required clearances, materials of construction, and performance data for all equipment.
b. Complete component list.
c. Detailed description of each component.
d. Catalog cut sheets for each component.
e. Fan performance curves with operating points.
f. Standard and custom color selection charts for finishing system.
g. Lubricant Specification: Furnish lubricant specification for type and grade required for equipment furnished.
h. Deviations from Contract Documents. Any exceptions to the Contract Documents must be clearly defined. Contractor shall be responsible for any additional expenses that may occur due to any exception made.
i. Other technical data related to specified material and equipment as requested by Engineer.

3. Testing Plans, Procedures, and Testing Limitations:
   a. Plan for performing required shop testing.
   b. Plan for performing required field testing.

B. Informational Submittals: Submit the following:
1. Certificates:
   a. Certification of painting systems, in accordance with "Finishing" Article in this Section.
   b. Independent certification reports:
      1) UL Label or equal.
      2) AMCA certification.
2. Manufacturer Instructions:
   a. Instructions and recommendations for handling, storing, protecting the equipment.
   b. Installation Data.
   c. Instructions for handling, start-up, and troubleshooting.
3. Source Quality Control Submittals:
   a. Written report presenting results of required shop testing.
   b. Factory test reports.
4. Field Quality Control Submittals:
   a. Written report presenting results of required field testing.
5. Supplier Reports:
   a. Submit written report of results of each visit to Site by Supplier's service personnel, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
6. Qualifications Statements:
   a. Manufacturer, when requested by Engineer.

C. Closeout Submittals: Submit the following:
1. Maintenance Contracts:
   a. Service shall be provided by a factory-trained and certified equipment manufacturer's representative during the One Year Correction Period.

The equipment manufacturer's representative shall maintain all equipment furnished under this Section during the first year of operation.

b. Service provided shall include the following:
    1) Quarterly On-Site Service: Service intervals shall be quarterly for a minimum of one day of eight hours each quarter. The service duration shall be increased, as necessary by the equipment manufacturer's representative, taking into consideration the equipment service requirements and equipment size. Equipment manufacturer's representative shall indicate the service duration and service scope. Prior to the visits, the equipment manufacturer's representative shall contact the Owner and inquire as to problems encountered with the equipment. Service visits shall be scheduled at times agreeable to the Owner at least one week in advance. The quarterly service shall include, but not limited to the following:
        a) Provide manufacturer's recommended maintenance.
        b) Check all controls and components, and recalibrate or adjust as necessary.
        c) Perform necessary cleaning and services that are scheduled on a quarterly basis in accordance with the approved Operations and Maintenance Manuals. Provide all expendable materials, as necessary.
        d) Review and provide recommendations concerning Owner's operations.
        e) Replace or repair defective controls and components.
        f) Inspect control panels. Test control panel's indication lights and replace defective lights.
        g) Provide a detailed field report to the Owner.
    2) Technical Support: Technical support shall be provided between the hours of 8:00 AM and 4:00 PM local standard time, Monday through Friday when requested by the Owner. Technical support shall include, but not limited to the following:
        a) Telephone Technical Support.
        b) On-Site Visits: If resolution of a problem is not achieved via the Telephone Technical Support, an on-site visit and field report shall be required.

2. Operations and Maintenance Data:
    a. Submit complete Installation, Operation and Maintenance Manuals, including, test reports, maintenance data and schedules, description of operation, and spare parts information.
    b. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 23, Operations and Maintenance Data.
3. Warranty Documentation:
    a. General warranty.
    b. Special warranties on materials and equipment.

D. Maintenance Material Submittals: Furnish the following:
    1. Spare Parts:
        a. Spare parts list and recommended quantities.

2. Tools:
    a. Two sets of special tools, if any, required for normal operation and maintenance.
3. Spare parts, extra stock materials, and tools shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the Owner at the conclusion of the Project.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
1. Deliver materials to the Site to ensure uninterrupted progress of the Work.
2. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of that Work.
3. Comply with manufacturer's recommendations for rigging of equipment.

B. Storage and Protection:
1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:
1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive Owner of other rights or remedies Owner may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under the Contract Documents. The obligations of Contractor under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.

B. Special Warranty on Materials and Equipment:
1. Provide manufacturer's written warranty, running to the benefit of Owner, agreeing to correct, or at option of Owner, remove or replace materials or equipment specified in this Section found to be defective during a period of 1 year after the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EQUIPMENT PERFORMANCE

A. Design Criteria:
   1. Design conditions shall be as indicated on the Equipment Schedule.
   2. Fan bearings shall be rated for a minimum L-10 life of 100,000 hours at the fan's maximum operating speed in accordance with ABMA 9 or 11.
   3. Fans shall be balanced in accordance with AMCA Standard 204.
   4. Fiberglass reinforced plastic fan construction shall conform to ASTM D4167.

B. Performance Criteria:
   1. Minimum performance data for each unit shall be as indicated on the Equipment Schedule. Provided equipment shall not exceed scheduled total power.
   2. Fans shall be performance rated in accordance with AMCA Standards 210, 300, and 301.

2.2 DETAILS OF EQUIPMENT

A. FRP Duct Axial Fan
   1. Product and Manufacturer: Provide one of the following:
      a. Series 29, as manufactured by Hartzell Fan Inc.
      b. Or equal.
   2. Housing:
      a. All fiberglass reinforced plastic surfaces shall be constructed of vinyl ester resin with 3 percent antimony trioxide to achieve Class I flame spread rate below 25 or equivalent and glass fiber.
      b. All structural parts in the air stream shall be fiberglass and resin.
      c. All internal hardware (air stream) shall be encapsulated Type 316 stainless steel.
      d. All external hardware (out of airstream) shall be Type 316 stainless steel.
      e. All air stream surfaces shall be provided with a synthetic veil and electrostatically conductive surface coating.
      f. Inspection door fastened with 316 stainless steel bot and gasketed for tight seal.
   3. Propeller:
      a. Air foiled designed.
      b. One piece construction.
      c. Cloth mat construction of solid fiberglass with aluminum insert molded into the hub for secure attachment to the shaft.
      d. Airfoil propeller shall not have an aerodynamic stall characteristic.

B. Fan Motors:
   1. Motors shall be premium efficiency, totally enclosed fan cooled (TEFC) type. Where TEFC motors are not available from the manufacturer, provide open drip proof (ODP) type with a letter from the manufacturer stating TEFC is not available.
   2. Motors shall have a service factor of 1.15.
   3. Motors shall be normal starting torque, normal slip, squirrel cage induction type. VFD driven motors shall be compatible for variable frequency drive operation and suitable to be applied in speed varying service without overheating.

4. Motors shall be of sufficient size so that there will be no overload on the motor above rated nameplate horsepower under any condition of operation imposed by the driven equipment.
5. Motors shall have Class F insulation with Class B temperature rise and be capable of carrying nameplate full load current plus service factor continuously without an injurious temperature rise in an ambient temperature of 40 degrees C.
6. Motor thrust bearings shall be adequate to carry continuous thrust loads under all conditions of operation imposed by the driven equipment.
7. Motors shall be in accordance with all current applicable standards of NEMA, IEEE, ABMA, NEC, and ANSI.
8. Locked rotor currents shall be as specified in NEMA Standards.
9. Provide lubrication of non-hygroscopic grease or oil type.
10. Provide automatic breather and drain for TEFC motor enclosures.
11. Two speed motors shall be provided with two windings per phase.
12. Provide integral overload protection on all single phase motors.
13. Provide motors rated for NFPA Class 1, Division 1 and/or Division 2 atmospheres where specified on the Equipment Schedule.

C. Belts and Drives:
1. Fans shall be belt drive with adjustable sheaves or direct drive as shown on the Equipment Schedule.
2. Belts shall be oil and heat resistant, non-static type.
3. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized with a minimum 1.5 service factor of the installed motor horsepower.

2.3 ACCESSORIES

A. Weather Cap:
1. For curb mounted supply duct axial fans.

B. Guide Vane Section:
1. As indicated on the Equipment Schedule of shown on the Drawings.

C. Prefabricated Roof Curbs:
1. Where specified on the Equipment Schedule or shown on the Drawings.
2. Construction:
   a. Weatherproof, fiberglass construction.
   b. Insulated with 1-1/2 inch minimum fiberglass sandwiched between inner and outer walls of curb.
   c. 12-inches minimum height measured from top of finished roofing system to top of pressure treated wood nailer strip. Contractor shall coordinate total height of curb with actual roofing system provided.
   d. Provide wood blocking and wood cant.
   e. Provide watertight flashing and counter flashing at curb.
3. Curb Gasket: Minimum 1-inch wide by 1/2-inch thick EPDM gasket cemented to curb top to provide air and water seal between curb and housing. Neoprene is not acceptable.

4. Fasteners: Type 316 stainless steel hardware.
5. Contractor shall furnish prefabricated roof curbs from the unit manufacturer.

D. Bird Screens:
1. For all roof mounted and wall mounted fans.
2. Provide 1-inch by 1-inch, 0.120-wire diameter, epoxy coated 316 stainless steel mesh screen securely anchored to housing.

E. Mounting Hardware:
1. Provide Type 316 stainless steel hardware for all fan installation.

F. Structural Supports:
1. Contractor shall provide and install all hangers, rods, supports, bolts, nuts, washers, inserts, and appurtenances as required to mount equipment where shown. All hangers, rods, supports, bolts, nuts, washers, inserts, and appurtenances shall conform to Section 23 05 29, Hangers and Supports for HVAC Ductwork, Piping, and Equipment.

2.4 FINISHING

A. All fiberglass surfaces shall be protected with a minimum 10 mil dry film thickness of chemical, flame, and ultraviolet resistant resin.

B. All gears, bearing surfaces, machined surfaces, and other surfaces that are to remain unpainted shall receive a heavy application of grease or other rust-resistant coating. Maintain coating during shipping and storage until equipment is placed into operation.

2.5 CONTROLS

A. Sequence of Operations:
1. Weaver:
a. Supply Fan (WVR-SF-2)
1) SF shall be controlled by an ON/OFF switch, provided by Electrical, set to run continuously.

2.6 IDENTIFICATION

A. All equipment and component identification shall be provided in accordance with Section 10 14 00, Signage.

B. All electrical wiring identification shall be provided in accordance with Section 26 05 53, Identification For Electrical Systems.

C. All electrical wiring shall be color-coded and labeled for simplified identification. Power wiring shall be coded per Owner standards.

2.7 SOURCE QUALITY CONTROL

A. Shop Tests:

1. Fan Tests:
    a. Except as described below or otherwise approved by Engineer, test one fan of each size in accordance with AMCA Standard 210. Tests are not required for standard fans for which data on previously tested units of equal design is available. Curves and other test data from units previously tested shall be submitted with shop test results prior to shipping equipment.
    b. Test each fan for minimum three hours run-time, at the manufacturer's plant with the job or test motor. Vibration and temperature measurements shall be taken to determine its mechanical integrity. Vibration level shall be limited to a maximum of 1.25 mils. Temperature of bearing housing near the end of run time shall not exceed 215 degrees F under artificially created ambient temperature of 104 degrees F.
    c. Each test shall be witnessed by a registered professional engineer, who may be an employee of fan manufacturer. The professional engineer shall certify that the required tests were performed, and sign and seal the results. Jurisdiction of professional engineer's registration, registration number, and name shall be on the seal. Equipment serial number shall also appear on test data for the fan.
2. Equipment shall be completely manufactured and pre-assembled in accordance with Reference Standards. Perform the following tests and inspections at factory before shipment:
    a. Tested and inspected for approval as a unit by Underwriters Laboratories Inc., UL Label or equal.
    b. Factory test equipment to ensure that the entire package has been properly fabricated and assembled, that all the controls function as specified herein and that the package meets the specified performance requirements including manufacturer's data report.
    c. Fan wheels and shafts shall be statically and dynamically balanced.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials and equipment will be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

B. Take field measurements where required prior to installation to ensure proper fitting of Work.

3.2 PREPARATION

A. Protection of Surrounding Areas/Surfaces:
    1. Openings and penetrations shall be capped to protect the building from outside conditions.

2. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

3.3 INSTALLATION

A. General:
   1. Install the equipment in accordance with the Contract Documents and by manufacturer's instructions and recommendations. Obtain written interpretation from Engineer in the event of conflict between manufacturer's instructions and recommendations and the Contract Documents.
   2. Install in accordance with Laws and Regulations.
   3. Do not modify structures to facilitate installation of equipment, unless approved in writing by Engineer.
   4. Installation to conform to requirements of all local and state codes.
   5. Roof curb mounted fans shall be provided with enough electrical wiring and conduit slack to allow the fan to be removed from the curb without disconnecting the electrical wiring at the fan.

3.4 FIELD QUALITY CONTROL

A. Field Tests:
   1. After equipment installation is complete, Contractor and a qualified field service representative of unit manufacturer shall perform an operating test and a sound test of each unit and associated controls, in presence of Engineer. Equipment will pass the test when each unit and its controls are demonstrated to function correctly, and sound levels do not exceed maximum limits.
   2. Running Tests:
      a. Field-test each equipment together with its controls and appurtenances. Tests shall demonstrate to Engineer that each part and all parts together function in accordance with the Contract Documents. Provide all necessary testing equipment, labor, and appurtenances.
      b. Verify that equipment operates at design point as intended, that vibration limits are not excessive and beyond manufacturer's recommendations, and that equipment operates smoothly without excessive noise, temperature rise, or other defects, across entire range of operating curve. Verify that all controls work as intended in both manual and automatic mode. Successfully test-operate each equipment for at least 24 hours.
      c. If equipment does not comply with the Contract Documents and does not pass the tests, Contractor shall adjust, modify, and retest the equipment as often as necessary until tests are successfully passed.

B. Manufacturer's Services:
   1. Provide a qualified, factory-trained service person to perform the following:
      a. Instruct Contractor in installing equipment.
      b. After installation, inspect and adjust equipment, verify proper operation, and assist with field testing.
      c. Instruct operations and maintenance personnel in operation and maintenance of the equipment.
   2. Manufacturer's service person shall make visits to the Site as follows:

a. First visit shall be for instructing Contractor in proper equipment installation, and assisting in installing equipment. Minimum number of hours on-Site: 8 hours.
b. Second visit shall be for checking completed installation, start-up of system; and performing field testing. Minimum number of hours on-Site: 8 hours.
c. Third visit shall be to instruct operations and maintenance personnel.
    1) Furnish services of manufacturer's qualified, factory-trained specialists to instruct operations and maintenance personnel in recommended operation and maintenance of equipment.
    2) Training requirements, duration of instruction, and qualifications shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
    3) Number of hours on-Site shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
d. Technician shall revisit the Site as often as necessary until installation is acceptable.

3. All costs, including expenses for travel, lodging, meals and incidentals, and cost of travel time, for visits to the Site shall be included in the Contract Price.

3.5 ADJUSTING

A. Adjust all controls for proper settings.

B. While system is operable, balance all equipment to achieve design conditions.

3.6 CLEANING

A. Thoroughly clean all equipment and accessories prior to installation.

B. Remove all dirt, rust, dust, etc. from equipment and accessories after installation.

C. Remove and dispose of all debris and waste from the Site resulting from installation.

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SECTION 23 37 23

HVAC GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install HVAC gravity ventilators complete and operational with accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the HVAC gravity ventilators Work.

C. Related Sections:
   1. Section 10 14 00, Signage.
   2. Section 23 05 29, Hangers and Supports for HVAC Ductwork, Piping, and Equipment.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM).
   1. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Minimum of five years of experience producing substantially similar equipment and able to show evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single HVAC gravity ventilator manufacturer.
   2. Require the HVAC gravity ventilator equipment manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall equipment assembly by the HVAC gravity ventilator equipment manufacturer.

C. Regulatory Requirements:
   1. National Electrical Code (NEC).
   2. National Fire Protection Association (NFPA).

3. Underwriters Laboratories Inc. (UL).
4. Local and State Building Codes and Ordinances.
5. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings showing fabrication methods, assembly, accessories, installation details, and diagrams.
      b. Setting drawings, templates, and directions for the installation of roof/equipment curbs, anchor bolts, and other anchorages.
   2. Product Data:
      a. Manufacturer's literature, illustrations, specifications, weight, dimensions, required clearances, materials of construction, and performance data for all equipment.
      b. Standard and custom color selection charts for finishing system.
      c. Deviations from Contract Documents. Any exceptions to the Contract Documents must be clearly defined. Contractor shall be responsible for any additional expenses that may occur due to any exception made.
      d. Other technical data related to specified material and equipment as requested by Engineer.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Certification of painting systems, in accordance with "Finishing" Article in this Section.
      b. Copy of manufacturer's ISO 9001:2000 certificate.
   2. Manufacturer Instructions:
      a. Instructions and recommendations for handling, storing, protecting the equipment.
      b. Installation Data.
      c. Instructions for handling, start-up, and troubleshooting.
   3. Source Quality Control Submittals:
      a. Written report presenting results of required shop testing.
      b. Factory test reports.
   4. Supplier Reports:
      a. Submit written report of results of each visit to Site by Supplier's service personnel, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
   5. Qualifications Statements:
      a. Manufacturer, when requested by Engineer.

C. Closeout Submittals: Submit the following:
   1. Operations and Maintenance Data:

a. Submit complete Installation, Operation and Maintenance Manuals, including, test reports, maintenance data and schedules, description of operation, and spare parts information.
b. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 23, Operations and Maintenance Data.

2. Warranty Documentation:
   a. General warranty.
   b. Special warranties on materials and equipment.

D. Maintenance Material Submittals: Furnish the following:
1. Spare Parts:
   a. Spare parts list and recommended quantities.
   b. One set of filters for each unit.
2. Extra Stock Materials:
   a. Touch up paint for each unit.
3. Tools:
   a. Two sets of special tools, if any, required for normal operation and maintenance.
4. Spare parts, extra stock materials, and tools shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the Owner at the conclusion of the Project.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
1. Cover all openings into gear boxes with vapor inhibiting and water repellent material.
2. Deliver materials to the Site to ensure uninterrupted progress of the Work.
3. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of that Work.
4. Comply with manufacturer's recommendations for rigging of equipment.

B. Storage and Protection:
1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:
1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive Owner of other rights or remedies Owner may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under the Contract Documents. The obligations of Contractor under the Contract Documents shall not be limited in any way by the provisions of the specified special warranty.

B. Special Warranty on Materials and Equipment:
   1. Provide manufacturer's written warranty, running to the benefit of Owner, agreeing to correct, or at option of Owner, remove or replace materials or equipment specified in this Section found to be defective during a period of 1 year after the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EQUIPMENT PERFORMANCE

A. Design Criteria:
   1. Design conditions shall be as indicated on the Equipment Schedule.

B. Performance Criteria:
   1. Minimum performance data for each unit shall be as indicated on the Equipment Schedule.

2.2 DETAILS OF EQUIPMENT

A. Dome Ventilators
   1. Product and Manufacturer: Provide one of the following:
      a. Model PR, as manufactured by Loren Cook Company.
      b. Model WCC, as manufactured by PennBarry.
      c. Or equal.
   2. Housing:
      a. Minimum 16-gauge spun aluminum construction reinforced with a rigid aluminum support structure.
      b. Baffle shall have a rolled bead for added strength.
      c. Type 316 stainless steel fasteners.
   3. Base:
      a. Aluminum construction with continuously welded curb cap corners.

2.3 ACCESSORIES

A. Prefabricated Roof Curbs
   1. Details of Construction:
      a. Weatherproof, continuous welded, minimum 14-gauge (0.064-inch), aluminum construction with pressure treated wood nailer.

b. Insulated with minimum 1-1/2 inch thick, 3 lb/ft^3 fiberglass sandwiched between inner and outer walls of curb.
c. 12-inches minimum height measured from top of finished roofing system to top of wood nailer. Contractor shall coordinate total height of curb with actual roofing system provided.
d. Provide wood blocking and wood cant as required.
e. Provide watertight flashing and counter flashing at curb.
f. Provide damper tray where backdraft damper is specified on the Equipment Schedule or shown on the Drawings.

2. Curb Gasket: Minimum 1-inch wide by 1/2-inch thick EPDM gasket cemented to curb top to provide air and water seal between curb and housing. Neoprene is not acceptable.
3. Ventilator to Curb and Curb to Roof Deck Fasteners: Type 316 stainless steel hardware.
4. Contractor shall furnish prefabricated roof curbs from the unit manufacturer.

B. Bird Screens
1. 3/4-inch by 3/4-inch expanded aluminum mesh screen securely anchored to housing.

C. Mounting Hardware
1. Provide Type 316 stainless steel hardware for all gravity ventilator installation.

D. Structural Supports
1. Contractor shall provide and install all hangers, rods, supports, bolts, nuts, washers, inserts, and appurtenances as required to mount equipment where shown. All hangers, rods, supports, bolts, nuts, washers, inserts, and appurtenances shall conform to Section 23 05 29, Hangers and Supports for HVAC Ductwork, Piping, and Equipment.

2.4 FINISHING

A. All surfaces shall be prepared, and coating systems applied and cured in strict accordance with the coating manufacturer's approved procedures. Primer coatings shall be selected for the specific material and application.

B. Primer coat and finish coat dry film thickness shall be applied to the required thickness as recommended by the coating manufacturer to provide maximum corrosion protection.

C. The equipment manufacturer shall furnish a written affidavit that the equipment has been prepared, primed, and coated in strict accordance with the coating manufacturer's procedures and at the coating manufacturer's facility.

D. All bearing surfaces, machined surfaces, and other surfaces that are to remain unpainted shall receive a heavy application of grease or other rust-resistant coating. Maintain coating during shipping and storage until equipment is placed into operation.

2.5 IDENTIFICATION

A. All equipment and component identification shall be provided in accordance with Section 10 14 00, Signage.

2.6 SOURCE QUALITY CONTROL

A. Shop Tests:
   1. Equipment shall be completely manufactured and pre-assembled in accordance with Reference Standards. Perform the following tests and inspections at factory before shipment:
      a. Factory test equipment to ensure that the entire package has been properly fabricated and assembled, that the package meets the specified performance requirements including manufacturer's data report.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials and equipment will be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

B. Take field measurements where required prior to installation to ensure proper fitting of Work.

3.2 PREPARATION

A. Protection of Surrounding Areas/Surfaces:
   1. Openings and penetrations shall be capped to protect the building from outside conditions.
   2. Equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical damage.

3.3 INSTALLATION

A. General:
   1. Install the equipment in accordance with the Contract Documents and by manufacturer's instructions and recommendations. Obtain written interpretation from Engineer in the event of conflict between manufacturer's instructions and recommendations and the Contract Documents.
   2. Install in accordance with Laws and Regulations.
   3. Do not modify structures to facilitate installation of equipment, unless approved in writing by Engineer.
   4. Installation to conform to requirements of all local and state codes.

3.4 ADJUSTING

A. Adjust all controls for proper settings.

B. While system is operable, balance all equipment to achieve design conditions.

3.5 CLEANING

A. Thoroughly clean all equipment and accessories prior to installation.

B. Remove all dirt, rust, dust, etc. from equipment and accessories after installation.

C. Remove and dispose of all debris and waste from the Site resulting from installation.

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SECTION 23 82 39.43

ELECTRIC UNIT HEATERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install electric unit heaters complete and operational with accessories.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before, the electric unit heaters Work.

C. Related Sections:
   1. Section 10 14 00, Signage.

1.2 REFERENCES

A. Air Movement and Control Association International, Inc. (AMCA).
   1. AMCA Standard 210 – Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.

B. Factory Mutual (FM).

C. National Electrical Code (NEC).

D. National Electrical Manufacturers Association (NEMA).

E. Underwriters Laboratories Inc. (UL).
   1. UL 873 – Temperature-Indicating and -Regulating Equipment.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Minimum of five years of experience producing substantially similar equipment and able to show evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single electric unit heater manufacturer.

2. Require the electric unit heater manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall equipment assembly by the electric unit heater manufacturer.

C. Regulatory Requirements:
1. Factory Mutual (FM).
2. National Electrical Code (NEC).
3. National Fire Protection Association (NFPA).
4. Underwriters Laboratories Inc. (UL).
5. Local and State Building Codes and Ordinances.
6. Permits: Contractor shall obtain and pay for all required permits, fees and inspections.

D. Certifications:
1. Electric unit heaters shall bear an approved label with all the necessary identification marks, electrical data, and any necessary cautions as required by the National Electric Code.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
1. Shop Drawings:
a. Drawings showing fabrication methods, assembly, accessories, installation details, and wiring diagrams.
2. Product Data:
a. Manufacturer's literature, illustrations, specifications, weight, dimensions, required clearances, materials of construction, and performance data for all equipment.
b. Complete component list.
c. Detailed description of each component.
d. Catalog cut sheets for each component.
e. Deviations from Contract Documents. Any exceptions to the Contract Documents must be clearly defined. Contractor shall be responsible for any additional expenses that may occur due to any exception made.
f. Other technical data related to specified material and equipment as requested by Engineer.

B. Informational Submittals: Submit the following:
1. Certificates:
a. Independent certification reports:
1) UL Label or equal.
2. Manufacturer Instructions:
a. Instructions and recommendations for handling, storing, protecting the equipment.
b. Installation Data.
c. Instructions for handling, start-up, and troubleshooting.

3. Source Quality Control Submittals:
    a. Written report presenting results of required shop testing.
    b. Factory test reports.
4. Field Quality Control Submittals:
    a. Written report presenting results of required field testing.
5. Supplier Reports:
    a. Submit written report of results of each visit to Site by Supplier's service personnel, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
6. Qualifications Statements:
    a. Manufacturer, when requested by Engineer.

C. Closeout Submittals: Submit the following:
1. Operations and Maintenance Data:
    a. Submit complete Installation, Operation and Maintenance Manuals, including, test reports, maintenance data and schedules, description of operation, and spare parts information.
    b. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 23, Operations and Maintenance Data.

D. Maintenance Material Submittals: Furnish the following:
1. Spare Parts:
    a. Spare parts list and recommended quantities.
2. Tools:
    a. Two sets of special tools, if any, required for normal operation and maintenance.
3. Spare parts and tools shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the Owner at the conclusion of the Project.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
1. Deliver materials to the Site to ensure uninterrupted progress of the Work.
2. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of that Work.
3. Comply with manufacturer's recommendations for rigging of equipment.

B. Storage and Protection:
1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Store all equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace lost equipment or components and repair damage to new condition, in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 EQUIPMENT PERFORMANCE

A. Design Criteria:
   1. Design conditions shall be as indicated on the Equipment Schedule.
   2. All electric unit heaters shall be UL Listed.

B. Performance Criteria:
   1. Minimum performance data for each unit shall be as indicated on the Equipment Schedule. Provided equipment shall not exceed scheduled total power.

2.2 DETAILS OF EQUIPMENT

A. Horizontal Unit Heaters (Corrosive Environment)
   1. Product and Manufacturer: Provide one of the following:
      a. Model HD3D, as manufactured by Chromalox.
      b. Model TRIAD, as manufactured by INDEECO.
      c. Or equal.
   2. Casing:
      a. Minimum 20-gauge Type 304 stainless steel construction.
      b. Provided with Type 304 stainless steel universal wall swivel bracket and mounting hardware.
   3. Heating Elements:
      a. Type 316 stainless steel fin tubular element.
   4. Fans:
      a. Epoxy coated aluminum broad blade, axial-flow type design.
      b. Attached with rubber vibration isolators.
   5. Fan Motors:
      a. Totally-enclosed-fan-cooled epoxy coated enclosure.
      b. Permanently lubricated bearings.
      c. Integral thermal cutout.
   6. Louvers:
      a. Same material of construction as casing.
      b. Individually adjustable for downward, upward or straight air flow.
   7. Controls:
      a. NEMA 4X control enclosure.
      b. Sub-divided circuits with individual fuse protection for all heaters with a total current draw of 48 A or greater.
      c. Heavy duty magnetic contactors.
      d. Thermal cutout with automatic reset.

e. Integral 120 VAC control transformer.
f. Integral fan delay relay to dissipate residual heat build-up after shutdown.
g. Green power indication light.
h. Thermostats:
    1) Integral Type (factory installed):
        a) Thermostat Setpoint Range: 40 degrees F – 90 degrees F.
        b) Adjustable knob.

2.3 IDENTIFICATION

A. All equipment and component identification shall be provided in accordance with Section 10 14 00, Signage.

2.4 SOURCE QUALITY CONTROL

A. Shop Tests:
    1. Equipment shall be completely manufactured and pre-assembled in accordance with Reference Standards. Perform the following tests and inspections at factory before shipment:
        a. Tested and inspected for approval as a unit by Underwriters Laboratories Inc., UL Label or equal.
        b. Factory test equipment to ensure that the entire package has been properly fabricated and assembled, that all the controls function as specified herein and that the package meets the specified performance requirements including manufacturer's data report.
        c. Fan wheels and shafts shall be statically and dynamically balanced.

2.5 CONTROLS:

A. EUH shall be controlled by a space thermostat set to maintain the space at 55°F.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials and equipment will be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

B. Take field measurements where required prior to installation to ensure proper fitting of Work.

3.2 INSTALLATION

A. General:
    1. Install the equipment in accordance with the Contract Documents and by manufacturer's instructions and recommendations. Obtain written

interpretation from Engineer in the event of conflict between manufacturer's instructions and recommendations and the Contract Documents.
2. Install in accordance with Laws and Regulations.
3. Do not modify structures to facilitate installation of equipment, unless approved in writing by Engineer.
4. Installation to conform to requirements of all local and state codes.

3.3 FIELD QUALITY CONTROL

A. Field Tests:
   1. After equipment installation is complete, Contractor and a qualified field service representative of unit manufacturer shall perform an operating test of each unit and associated controls, in presence of Engineer. Equipment will pass the test when each unit and its controls are demonstrated to function correctly.
   2. Running Tests:
      a. Field-test each equipment together with its controls and appurtenances. Tests shall demonstrate to Engineer that each part and all parts together function in accordance with the Contract Documents. Provide all necessary testing equipment, labor, and appurtenances.
      b. Verify that equipment operates at design point as intended, that vibration limits are not excessive and beyond manufacturer's recommendations, and that equipment operates smoothly without excessive noise, temperature rise, or other defects, across entire range of operating curve. Verify that all controls work as intended. Successfully test-operate each equipment for at least 24 hours.
      c. If equipment does not comply with the Contract Documents and does not pass the tests, Contractor shall adjust, modify, and retest the equipment as often as necessary until tests are successfully passed.

B. Manufacturer's Services:
   1. Provide a qualified, factory-trained service person to perform the following:
      a. Instruct Contractor in installing equipment.
      b. After installation, inspect and adjust equipment, verify proper operation, and assist with field testing.
      c. Instruct operations and maintenance personnel in operation and maintenance of the equipment.
   2. Manufacturer's service person shall make visits to the Site as follows:
      a. First visit shall be for instructing Contractor in proper equipment installation, and assisting in installing equipment. Minimum number of hours on-Site: 8 hours.
      b. Second visit shall be for checking completed installation, start-up of system; and performing field testing. Minimum number of hours on-Site: 8 hours.
      c. Third visit shall be to instruct operations and maintenance personnel.
         1) Furnish services of manufacturer's qualified, factory-trained specialists to instruct operations and maintenance personnel in recommended operation and maintenance of equipment.

2) Training requirements, duration of instruction, and qualifications shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
3) Number of hours on-Site shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.

d. Technician shall revisit the Site as often as necessary until installation is acceptable.

3. All costs, including expenses for travel, lodging, meals and incidentals, and cost of travel time, for visits to the Site shall be included in the Contract Price.

3.4 ADJUSTING

A. Adjust all controls for proper settings.

B. Position unit as shown on the Drawings and adjust outlet louvers and diffusers for maximum throw.

3.5 CLEANING

A. Thoroughly clean all equipment and accessories prior to installation.

B. Remove all dirt, rust, dust, etc. from equipment and accessories after installation.

C. Remove and dispose of all debris and waste from the Site resulting from installation.

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SECTION 26 05 00

ELECTRICAL WORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. General work description and requirements for electrical work included in this contract.

B. Raceways, fittings and boxes.

C. Conductors and accessories.

D. Wiring devices.

E. Grounding.

F. Panelboards.

G. Disconnect and safety switches.

H. Nameplates and labels.

I. Spare devices.

1.2 RELATED SECTIONS

A. General Clauses

B. Special Clauses

C. Section 26 27 16 – CONTROL PANELS AND ENCLOSURES

D. Section 26 05 26 - GROUNDING

E. Section 26 05 29 – ELECTRICAL SUPPORTS, ANCHORS, AND FASTENERS

F. Section 26 08 00 – TESTING AND INSPECTION

1.3 GENERAL REQUIREMENTS

A. All work shall be subject to applicable sections of these specifications, not necessarily the aforementioned related sections.

B. Examination of Premises
   1. Before submitting a proposal, the Contractor shall examine all drawings and specifications relating to work of all trades to determine scope and relation to other work.
   2. Ascertain access to site, available storage, and delivery facilities.
   3. Before commencing work, verify all governing dimensions and examine all adjacent work at site and/or buildings.
   4. Some equipment or material items may be special order items having long order times and shall be ordered well in advance of installation. Unavailability due to long lead times or special orders is not an excuse for not providing the specified items.

1.4 SCOPE OF WORK

A. The principal items of electrical work include, but are not necessarily limited to, the following:
   1. Provide all electrical power, lighting, control, instrumentation, ductbanks, communications systems, including exposed and concealed raceway systems, conductors, cables, fittings, special control, wiring devices, distribution equipment, reduced voltage starters (RVSSs), overcurrent protection, terminations, connections, and interconnections, and all related appurtenances to provide a complete and operating electrical system.
   2. Provide all system and equipment grounding in conformance with the requirements of these specifications and the National Electrical Code (NEC).
   3. Provide electrical labels, signs, and nameplates per this section.
   4. Install all electrical equipment, conduit, wire, conductors, cable, connections, etc., required for complete and operating systems.
   5. Coordinate work with the work of others for timely completion of the work of this contract.
   6. Repair, fill and/or patch surfaces of all building components including walls, floors, ceilings, and roofs damaged or left open or bare as a result of the electrical work.
   7. Have an Owner-approved third-party inspecting agency inspect electrical installation. Submit a final certificate approving all work to the Engineer prior to final acceptance of the electrical work.
   8. See Division 01 for additional requirements for record drawings, operation and maintenance manual, final testing and inspection, and guarantees and warranties.
   9. Provide all materials, equipment, and labor required for complete and operating electrical power and instrumentation systems.
   10. Perform all trenching, backfilling, compaction, restoration of surfaces, dewatering (as required), ductbank fabrication, and pole installation required for grounding system, electric services, distribution, and instrumentation.

1.5 CODES AND STANDARDS

A. Reference to various codes and standards are a minimum installation requirements standard. In case(s) of discrepancy between the Contract Documents and the

NEC, the stricter requirement shall apply.

B. All work, equipment, and materials furnished shall conform with the existing rules, requirements, and specifications of the Insurance Rating Organization having jurisdiction; the NEC; National Electric Manufacturer's Association (NEMA); Underwriters Laboratories (U.L.); and the respective utilities.

C. All material and equipment shall bear the inspection labels of Underwriters Laboratories, unless otherwise allowed by the Engineer in writing and if the material and equipment is of the class inspected by said laboratories. All labeling shall be for the intended usage.

D. The Contractor shall be held responsible for adherence to all rules, requirements, and specifications as set forth above. Any additional work or material necessary for adherence will not be allowed as an extra, but shall be included in the bid price. Ignorance of any rule, requirement, or specification shall not be allowed as an excuse for non-conformity. Acceptance by the Owner or Engineer does not relieve the Contractor from the expense involved for the correction of any errors which may exist in the drawings submitted or in the satisfactory operation of any equipment.

1.6 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 33 00, Submittal Procedures.

B. The Engineer's approval shall be obtained for all equipment and material for which shop drawings are required before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site.

C. Provide submittals for all conduit, wire, cable, boxes other than device boxes, enclosures, fittings, hangers, supports, outlets, disconnect switches, lighting fixtures, ballasts, starters, overloads, overcurrent devices, panelboards, control and starter panels, VFDs, seal-offs, and all other electrical equipment as listed in other sections.

D. Provide submittals for all Division 26 and Division 40 electrical and instrumentation work.

E. CONDUIT LAYOUT SUBMITTAL: Provide submittals for all interior and exterior conduit layout. Submittals shall be 11x17 or 24x36, scaled drawings indicating conduit routing, elevations, quantity and type of conduits, quantity and type of wires, and conduit source and destination. All pull and junction boxes shall also be noted on the drawings. Conduits shall be tagged/labeled on the drawings and likewise labeled during installation.

1.07 RECORD DRAWINGS

A. In addition to the requirements of Section 01 78 39, Project Record Documents, regarding record drawings, prepare and submit marked-up field record drawings, which shall include all addenda items and changes made during construction, to the Engineer prior to final acceptance. Additionally, submit record drawings consisting of the following three types of drawings:

1. ELEMENTARY OR SCHEMATIC DIAGRAMS - All control schematics and elementary diagrams. Those constructed as shown on Contract Drawings need only be verified on the marked-up field set. For those that changed, submit preliminary revised schematic and elementary diagrams for the Engineer's review. Once reviewed and approved, these diagrams shall be drafted on 24-inch by 36-inch sheets and added as "__A" sheets.
2. BLOCK DIAGRAMS - Prepare and submit fully labeled block diagrams, showing all point-to-point connections giving conduit size and fill (each conductor number, size, and color listed) showing all junctions boxes, pullboxes, panels, etc., together with terminal numbers at all conductor terminations. Each wire shall be assigned a unique identification tag, reflecting the label installed in the field. Initially, hand sketches on 8-1/2-inch by 11-inch sheets can be submitted for review. Once reviewed and approved, these designs shall be drafted on 24-inch by 36-inch sheets with suitable title block data. Block diagrams are to be updated to reflect all final connections (connections labeled) or other changes. When there is more than one sheet of block diagrams, an index shall be included to indicate on which sheet the respective pieces of equipment can be found. See sample attached to end of this Section.
3. Contractor's As-built Drawings - Provide one 24-inch by 36-inch copies of electrical as-built drawings of the Contract Drawings with all field notes and comments to illustrate actual construction conditions. As-built drawings shall include all addenda items issued during bidding and all other changes to the documents that occurred during construction. Drawing to be titled "Contractor's As-built Drawing, Prepared by: __(name of Contactor__, Date Issued: _____."
4. Electronic copies of the as-bid set of Contract Drawings will be provided to the Contractor for use in record drawing preparation. Contractor shall modify the as-bid set of drawings for record drawings. All drawings shall be prepared using AutoCAD drafting; no paste-on information will be allowed.

B. Submit a final record drawing copy on 24-inch by 36-inch vellum for the Engineer's review.

C. "A" drawings shall be prepared (24-inch by 36-inch) showing all concealed conduit including ductbanks that cannot be shown clearly on the marked-up field set. All underground conduit routings and ductbanks shall be dimensioned from aboveground structures. All manholes, handholes, pullboxes, and bends without structures shall have at least two ties.

D. Once final approval of the drawings with corrections is provided to the Contractor, all final drawings shall be provided on a compact disc and produced

using the computer-aided drafting system, AutoCAD 2014, as a minimum. Later revisions shall be saved as this version.

1.8 EQUIPMENT PROTECTION

A. Equipment and material shall be delivered to the site in new, unused condition in original packaging. Contractor shall be responsible to store equipment and protect against damage, theft, dirt, moisture and temperature extremes.

B. All switchboards, motor control centers, programmable logic controllers, variable frequency drive, and instrumentation to be transported under this contract shall be shipped to and from the site in enclosed, weathertight, sealed containers in a manner designed to protect the units against damaging stress caused by sudden acceleration or deceleration. An indicating meter, such as "Drop-N-Tell," designed to indicate any sudden impacts that exceed the unit's rating shall be shipped with and fixed to each assembly or its packing crate. Upon arrival of each shipment at the project site, the meter shall be examined in the presence of representatives of the Engineer, the Contractor, and the equipment manufacturer. If the acceleration indicates the package exceeded the limits of the meter, the assembly or subassembly shall be dismantled and completely inspected. All damage shall be corrected before the equipment is incorporated into the work. The Contractor shall bear all cost arising out of dismantling, inspection, repair, and reassembly, including engineering costs. The meters shall be sized for three times the weight of the packaged item.

C. During the installation of equipment, controls, controllers, circuit protective devices, etc., these items shall be protected against entry of foreign matter and be vacuum cleaned both inside and outside before testing and operation.

D. Damaged equipment, as determined by the Owner and/or the Engineer, shall either be repaired to new condition or replaced with new equipment.

E. Painted surfaces shall be protected with factory installed removable heavy craft paper, sheet vinyl or similar protective cover.

1.9 EQUIPMENT INSTALLATION AND REQUIREMENTS

A. The locations of equipment, fixtures, outlets and similar devices shown on the Contract Drawings are approximate only.

Equipment shall be installed as close as practical to locations shown on the Drawings. Where Contractor supplied equipment sizes differ from that anticipated on the Drawings, the Contractor shall prepare and submit to the Engineer new "to scale" layouts showing new equipment locations for approval.

B. Equipment Provided Under Other Divisions

1. Reasonable effort has been made to show the actual locations and sizes of the equipment to be provided under other sections of the specifications and

installed by other trades for the project. These locations shall be considered approximate, but suitable for preparation of the Contractor's bid. These locations are not necessarily final locations. Contractor shall verify equipment size and location with the installing trades before rough in and obtain the applicable shop drawing information to enable the electrical trade(s) to furnish and install electrical service to the equipment, at no cost to the Owner.

2. The Contractor and/or the electrical installer(s) shall coordinate the exact locations of all equipment, receptacles, box-outs, sleeves and similar items required for the completion of electrical work with the structural, architectural, mechanical or other work.
3. The wiring configuration of equipment provided by other divisions will vary, depending on the manufacturer used. Specific wire connections to equipment provided by other divisions are not shown in these documents. The electrical installer(s) shall coordinate the wire connections with the division supplying the equipment.
4. No additional compensation will be made for relocations, reconnections or additional work required as a result of the failure of the Contractor and/or the electrical installer(s) to fully coordinate the work of all trades.

C. Inaccessible Equipment
   1. Where the Engineer determines that the Contractor or his subcontractors has installed equipment that is not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled as required by the Engineer at the Contractor's expense.
   2. "Conveniently accessible" is defined as reachable without the use of ladders, without climbing over or crawling under obstacles such as equipment, structures, piping and ductwork. Equipment shall be installed at the heights as specified in other sections of these specifications, except any readout devices shall be installed so that the centerline of the readout is 5 feet 0 inches above finish floor.

D. Equipment and Material - Equipment and material shall be designed to assure satisfactory operation and operating life for environmental conditions where being installed. These specifications, the NEC, and other code requirements shall apply to the installation in areas requiring special protection; i.e., hazardous, wet or corrosive area/location, and weatherproof construction.

E. Classified Areas
   1. General - Enclosures for classified areas shall be as specified in Section 16161, Control Panels and Enclosures.
   2. Hazardous Areas
      a. In the areas designated as hazardous and where explosionproof work is shown or specified, all work shall meet the requirements of the NEC for the classification of that location.
      b. Equipment enclosures shall be approved for use in the atmosphere of the area in which they are installed, i.e., Class I, Division 1, Group D; Class I, Division 2, Group D atmospheres.

3. Wet and Outdoor Locations - Where installed outdoors or in areas designated as wet locations, all work shall meet the requirements of these specifications and of the NEC for wet locations.
4. Corrosive Areas - All equipment shall be corrosion resistant in areas so designated unless specified otherwise.

F. Rigging and Moving Equipment - Contractor and his subcontractors shall exercise extreme care and caution in moving and installing equipment. Skilled riggers shall be employed to move any equipment over 300 lbs. or of sufficient bulk. Proper falsework, skids, blocking, runways, supports of new or existing work, or other devices shall be employed when moving or placing equipment.

G. Diagrammatic Drawings
1. Circuit diagrams shown are diagrammatic and functional only and are not intended to show exact circuit or wiring layouts, number of fittings or other installation details. The Contractor shall furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems shown.
2. Circuits beyond their pushbutton and control device and conduits containing lighting circuits beyond panelboards are not always shown or scheduled.
3. The number of conductors shown is not necessarily the correct number required. Contractor shall install as many conductors as are required for the complete and satisfactory operation of all systems.

H. Conductor Sizing - Conductor sizes are shown for equipment branch circuits extending less than 100 feet from power source. Refer to schedule in this section for sizing conductors on circuits more than 100 feet long. Conduit sizes shall change accordingly. Contractor shall include this cost in his bid.

PART 2 – MATERIALS

2.1 RACEWAYS, FITTINGS AND BOXES

A. Raceways
1. Type A - Rigid Galvanized Steel Conduit (RGS)
a. Application - Unless otherwise indicated on the Contract Drawings or under this Specification Section, all wiring shall be run in Type A conduit.
b. Description - Hot dipped galvanized rigid steel conduit, shall conform to ASA C80-1.
c. Manufacturers
1) Youngstown.
2) Pittsburgh Standard (RobRoy Industries).
3) Triangle.
4) Or approved equal.

2. Type D - Rigid Non-metallic Conduit Schedule 40 (PVC)
    a. This conduit shall be used in ductbanks. This type conduit shall be not used for stub-ups from ductbanks. Stub-ups shall be Type E.
    b. Description - Rigid, non-metallic conduit, shall be rigid PVC, Schedule 40 and shall conform to Federal Specifications W-C-1094 and Underwriters Laboratories, Inc. Standard UL-651.
    c. Service entrance conduit – service entrance ductbanks (from utility point of service to metering equipment) shall be Schedule 40 HDPE, rigid, non-metallic conduit as required by the Utility Company.
    d. Manufacturers
        1) Pittsburgh Standard (RobRoy Industries).
        2) Allied.
        3) Carlon.
        4) Or approved equal.
3. Type E – PVC-Coated Rigid Steel Conduit with an Interior Urethane Coating
    a. Application - This conduit shall be used in the following areas: hazardous, wet, outdoor and corrosive areas.
    b. Description – PVC-coated, rigid steel conduit. Shall conform to Federal Specification WWC-581d and be coated with a heat polymerizing adhesive prior to plastic coating. PVC coating shall be applied by plastisol method. The interior coating shall be a factory-applied two-part 2 mil thick chemically cured hot dipped urethane coating. The conduit shall conform to NEMA Standard No. RNI-1986.
    c. Manufacturers
        1) Pittsburgh Standard (RobRoy Industries).
        2) OCAL.
        3) Or approved equal.
4. Type G - Liquid-tight Flexible Conduit
    a. Application - For use in wet areas as final connection to heating and ventilating equipment, motors, and other vibrating equipment.
    b. Description - Liquid-tight, flexible conduit shall be flexible galvanized steel case with extruded PVC jacket.
    c. Manufacturers
        1) Pittsburgh Standard (RobRoy Industries).
        2) Anonconda.
        3) Triangle.
        4) Keystone.
        5) O.Z. Gedney.
        6) Or approved equal.
5. Type H - Explosionproof, Flexible Conduit
    a. Application - For use in hazardous areas as final connection to lighting, heating and ventilating equipment, motors, and other vibrating equipment.
    b. Description - Explosionproof, flexible conduit shall be flexible core with bronze braid covering and steel end fittings.
    c. Manufacturers
        1) Crouse-Hinds.

2) Appleton.
3) Killark.
4) Or approved equal.

B. Conduit Fittings
   1. All Fittings – Cast-type material and coatings shall match conduit system it is to be used with.
   2. Covers shall be of the same material as the fittings to which they are attached. Provide gaskets for exterior use and for interior wet areas.

C. Expansion Deflection Fittings
   1. Material shall match conduit system it is to be used with, designed for 4-inch movement.
   2. Coupling shall compensate for the following movements:
      a. Axial expansion or contraction.
      b. Angular misalignment.
      c. Parallel misalignment.

D. Access Fitting and Pulling Fitting - Of the same construction as conduit fittings. Provide cover gasket for interior wet locations and exterior areas. For corrosive areas, use PVC or fiberglass boxes.

E. Boxes
   1. Outlet and Device - Of the same construction as conduit fittings. Provide cover gasket in wet locations.
   2. Junction and Pullboxes - Of the same construction as conduit fittings. Up to 100 cubic inches. Larger interior non-classified area boxes shall be galvanized with hinged covers. Exterior and interior wet, non-corrosive areas shall be stainless steel. Provide cover gasket in wet or corrosive locations. Provide terminal strips for joining conductors in boxes over 100 cubic inches.

F. Elbows - Factory made by same manufacturer as couplings or conduit. Material to match conduit system it is to be used with.

G. Miscellaneous
   1. Nipples, Locknuts, and Bushings - Factory made; material to match conduit system it is to be used with.

H. Conduit and Core Hole Sealing - Mechanical link type with elastomeric links joined by stainless steel bolts which also serve to expand the seal. Manufacturer - Thunderline Corporation, Model “Linkseal.” Shall be fire rated when used in fire walls.

2.2 CONDUCTORS AND ACCESSORIES

A. Conductors: Application - Material - Manufacturers
   1. Multi-Conductor Power and Control Cable

a. Application - For use in place of building wire and cable when powering three-phase equipment or for consolidating the number of power and control cables between two locations.
b. Description - Multi-conductor, Type TC cable.
    1) Conductor - Stranded copper.
    2) Insulation Voltage Rating - 600 volts.
    3) Insulation Material - PVC with phase indicators for individual conductors and nylon or PVC for overall jacket.
c. Manufacturers
    1) Anixter - Model 3G.
    2) Cablec - Model AP14321.
    3) Belden – Tray cable.
    4) Or approved equal.

2. Building Wire and Cable
    a. Application - For general use for all conductor applications unless specifically called out otherwise. Not for use as instrumentation cable or in manufactured control panels, service entrance cable, and submersible cable.
    b. Description - Single conductor insulated wire type as indicated below.
        1) Conductor - Stranded copper only.
        2) Insulation Voltage Rating - 600 volts.
        3) Insulation Type - Type XHHW for feeders and branch circuits.
        4) Insulation Material - PVC or thermoplastic with nylon overall jacket.
    c. Manufacturers
        1) Southwire – Type XHHW
        2) General Cable – Type XHHW
        3) Okonite - Model 116-67.
        4) Or approved equal.
3. Twisted Instrumentation Cable (Interior)
    a. Application - For signal or instrumentation wiring and use where called for on Contract Drawings.
    b. Description - Single or multi, twisted pair and twisted triad cable with overall shield.
        1) Conductor - Stranded copper, Size 16 AWG.
        2) Insulation Voltage Rating - 600 volts.
        3) Insulation Material - Color coded PVC for individual conductors and nylon or overall jacket.
        4) Shielding – 100 percent overall aluminum or aluminum/polyester foil.
        5) Drain - Tinned copper wire.
    c. Manufacturers
        1) Alpha - Model 2471 (2421).
        2) Belden - Model 8719 (8760).
        3) Or approved equal.
4. Twisted Instrumentation Cable (Exterior and Ductbanks)
    a. Description - Single and multi-twisted pair cable with overall shield.
    b. Conductor - Stranded copper, size 16 AWG.

c. Insulation Voltage Rating - 600 volts.
d. Insulation - PVC.
e. Shielding, Single Pair - Aluminum/polyester tape.
f. Drain - Tinned copper drain wire.
g. Overall Jacket - Nylon.
h. Manufacturers
    1) Okonite Company - Type P-OS, Model 264.
    2) Belden Model 9342.
    3) General Cable BICC, No. 125986.
    4) Or approved equal.

5. Telecommunication Cable (for Interior Use)
    a. Application - For use where called for on Contract Drawings.
    b. Description - Multi-conductor cable, insulated and twisted into pairs.
        1) Conductor - Solid copper, minimum Size 24.
        2) Insulation Material - Color-coded PVC for individual conductors and PVC for overall jacket.
        3) Rip Cord - If available.
        4) Outer Jacket - PVC.
    c. Manufacturers
        1) Anixter - Inside wiring, Model CAT 6 Type CMR.
        2) Belden – CAT 6, Model 1232A1.
        3) General Cable – CAT 6 UTP Type CMR.
        4) Or approved equal.
6. Telecommunication Cable for Underground Ductbank Installations
    a. Description - Multi-conductor cable. Insulated conductor is twisted into pairs for installation in ductbanks.
    b. Conductor - Minimum size No. 24 solid, annealed, bare copper.
    c. Insulation – Color-coded, polyethylene or polypropylene.
    d. Units - Pairs stranded into units.
    e. Cover - Wire bundle covered with non-hyroscopic tape.
    f. Sheath - Aluminum shield.
    g. Jacket - Polyethylene; marked at foot intervals. Outdoor plant rated.
    h. Manufacturers
        1) Anixter – Type RUS/REA PE-89.
        2) General Cable – Type RUS (REA) P-89AL.
        3) Or approved equal.
7. Submersible Motor Conductors
    a. Description - Submersible, non-hazardous, extra heavy usage.
    b. Conductor - Stranded copper.
    c. Insulation Voltage Rating - 600 volts.
    d. Insulation - EPD and CP or EP (ethylene propylene) with phase indicators.
    e. Manufacturers
        1) Anixter - Model 4 PC.
        2) Okonite.
        3) Cable supplied with and as part of the manufacturer’s standard product offering.
        4) Or approved equal.

8. Bonding and Grounding Conductors
    a. Application - For use as needed to meet the requirements of this specification as shown on the Drawings and the NEC for bonding and grounding.
    b. Description - Multi-conductor cable, insulated conductor is twisted into pairs.
        1) Conductor - Bare copper wire.
        2) Stranding - Solid ASTM B-1 for Sizes No. 8 and smaller. Stranded ASTM B-8 for Sizes No. 6 and larger.
        3) Grounding system conductor from inside equipment to grounding rods or plates and under ductbanks shall be tin-plated. Note: This is a special item; order well in advance of installation.
    c. Manufacturers
        1) Anixter - Model 1A or 1B.
        2) Cablec - Molded “bare and coated copper conductors” listed under Section 7, “Special Purpose Cables.”
        3) Or approved equal.
9. Control Panel Wire
    a. Application - For use in all manufactured or custom built control panels.
    b. Description - 90 degrees C machine tool wire.
        1) Conductor - Minimum Size AWG #16, 19 strand.
        2) Insulation - PVC, 2/64-inch for 600 V service.
    c. Manufacturers
        1) Carol - Catalog Series 7600.
        2) Anixter - Catalog Series 6W.
        3) Or approved equal.
10. Multi-Conductor -1000V Flexible Motor Supply Cable (VFD Cable)
    a. Application – For use as motor wiring for VFD driven equipment.
    b. Description – 90 degrees C AC motor drive, VFD motor cable.
        1) Four-conductor, three-stranded tinned copper circuit conductors plus one ground wire with PVC insulation, XLP insulation.
        2) Overall foil shield (100 percent coverage) plus tinned copper braid shield (85 percent coverage), tinned copper drain wire.
        3) Overall sun and oil-resistant PVC jacket.
11. Manufacturers - Belden Model No. 29502.

B. Wire Terminations and Connectors
    1. General
        a. Connector material shall be compatible with the wire that it is to be used with.
        b. Connectors made of aluminum shall not be used with copper conductors.
        c. Connectors listed below are for use with copper wire. Connectors to be used with aluminum wire shall be of the same general type and construction as those listed below, but shall be suitable for use with aluminum conductors.
    2. Terminal Block Manufacture

a. Control Wiring
    1) Buchanan - Model 0241.
    2) Connectron - Model NSS3.
    3) Or approved equal.
b. Equipment Power Wiring
    1) Buchanan - Model 416.
    2) Connectron - Model NC3.
    3) Or approved equal.

3. Two-Way Splices
    a. Description - Tubular compression type for conductors 1/0 and larger. Rated 600 VAC and uninsulated.
    b. Manufacturer
        1) Burndy - Model YS-L “Hylink.”
        2) Thomas & Betts - Model 545.
        3) 3M Model 10000.
        4) Or approved equal.
4. Crimp Connectors
    a. Description - For branch circuit connections, other than lighting and receptacle circuits.
    b. Manufacturers
        1) Ideal - Series 30; Model 410, 411, 412 with Model 415 and 417 insulator.
        2) Thomas & Betts - Model PT66M.
        3) Or approved equal.
5. Bus or Lug Terminals, Manufacturer - 600 VAC, Crimp Type
    a. Burndy - “HYLUG” Catalog, Series YA.
    b. Ideal - Catalog Series CCL and CC.
    c. Or approved equal.
6. Terminal Strip Connectors
    a. Description - For control and instrumentation connections to terminal strips. Locking fork, vinyl, self-insulated, crimp-type connectors or tubular clamp type.
    b. Manufacturers
        1) Burndy - “VINYLUG” Types TP-LF and BA-EL.
        2) Thomas & Betts - Catalog Series 18RA, 14RB, and 10RC.
        3) Ideal - Series 83-7.
        4) Or approved equal.
7. Wire Nuts
    a. For Unclassified Areas - Hexagonal-shaped for use with a nut driver, compact swept-wings, ribbed cap, UL-listed for 600V with temperature rating of 105 degrees C (221 degrees F).
        1) Ideal - Models 341 and 342.
        2) 3M - Models 212, 312, and 512.
        3) Buchanan - Models B-1, B-2, and B-4.
        4) Or approved equal.

b. For Wet, Corrosive, and Hazardous Areas - Compact swept-wings, ribbed cap, filled with non-hardening sealant, UL listed for 600V with temperature rating of 105 degrees C (221 degrees F).
   1) Ideal - Model DB Plus.
   2) Buchanan - Model BTS2 and BTS4.
   3) Or approved equal.

8. Bolted Wire Connectors - Mechanical connectors for all combination of copper and aluminum conductors. Connectors shall be of a compact high-strength design, tin-plated copper alloy, two-piece connector, and shall utilize two hex head bolts.
   a. Burndy - Model KVSU.
   b. Ideal.
   c. Ilsco Corp.
   d. Or approved equal.

2.3 WIRING DEVICES

A. Wall Switches

1. Types, Manufacturers, and Catalog Numbers

CONTACT	P&S	LEVITON	G.E.	HUBBELL
1-pole	20AC-1	1221-2	GE5951-1G	1221
2-pole	20AC-2	1222-2	GE5952-1G	1222
3-way	20AC-3	1223-2	GE5953-1G	1223
4-way	20AC-4	1224-2	GE5954-1G	1224
3-position	1225	--	GE5957-1	1387
Pilot, 1-pole	20AC-1-RPL	1221-PL	SP121-8G	1221PL
Locator, 1-pole	PS20AC-1-CSL	1221-LHC	SL122-2G	1221IL

Hazardous Area, Class I, Divisions 1 and 2, 1-pole factory sealed snap switch or manual motor starting switch - Crouse Hinds, Model EDS Series; or Appleton, Model EDS Series with selector switch covers.

B. Receptacles (Note: All receptacles shall be “side wired” style. “Push-in” styles are not acceptable.)
   1. Single Convenience Receptacle
      a. Pass & Seymour, Inc. - Model 5361.
      b. Hubbell - Model 5361.
      c. General Electric - Model 4102.
      d. Leviton - Model 5361.
   2. Duplex Convenience Receptacle (Interior Use Only) - 20 amp, 125 volt.
      a. Pass & Seymour, Inc. - Model 5362.
      b. Hubbell - Model 5362.
      c. General Electric Co. - Model GE5342.
      d. Leviton - Model 5362.

3. GFCI Receptacle
    a. Pass & Seymour, Inc. - Model 2091-S.
    b. Hubbell - Model GF-5362.
    c. General Electric - Model GFR-5342.
    d. Leviton - Model 6899.
4. Dust and Moisture-Resistant Receptacle, Gray Face, Exterior Use
    a. Pass & Seymour, Inc. - Model CR6307.
5. Explosionproof Receptacle, Class I, Division 1, 20 Amp, 125 Volt
    a. Single gang, feed-thru units.
        1) Crouse Hinds - Model ENRC21201.
        2) Appleton Electric Company - Model EFSC175-2023.
    b. Single gang, dead-end units.
        1) Crouse Hinds - Model ENR21201.
        2) Appleton Electric Company - Model EFS175-2023

C. Verify wall openings are neatly cut and will be completely covered by wall plates.

D. Wall Plates - Install receptacle and switchplates in accordance with the following schedule:
1. Interior, Unclassified
    a. Finished Areas - Standard ivory non-metallic.
    b. Unfinished
        1) Concealed Wiring - Standard non-metallic brown plates.
        2) Surface-Mounted Raceway - Standard brown non-metallic receptacle plates. Standard brown non-metallic switchplates.
2. Interior, Wet Areas
    a. Non-metallic weatherproof receptacle plate.
    b. Stainless steel switchplate.

2.4 GROUNDING

A. Existing ground system shall remain intact. Any portions that are disturbed during construction shall be restored or replaced.

B. Size of grounding and bonding conductors shall be as shown but not smaller than required by the NEC, Articles 250-66 and 250-122.

C. See specification 26 05 26 Grounding for additional requirements.

2.5 PANELBOARDS

A. General
1. Interiors
    a. All interiors shall be completely factory assembled.
    b. Neutral bars to be full size and insulated. Neutral bussing to have suitable lugs for each feeder. In subfeed panels, neutral shall be isolated from ground.
    c. Provide a ground bus in each panel.

2. Boxes - Panelboards
    a. Provide at least minimum gutter space in accordance with NEC.
    b. Provide a minimum of four interior mounting studs.
    c. Provide door within a door front cover.
    d. Enclosures shall be as scheduled on the drawings, NEMA 12 minimum.
3. Trim
    a. Provide barriers as required for completely dead-front construction.
    b. Provide minimum projection, chrome-plated latch with key lock on panelboards. Key all locks alike.
    c. Provide heavy plastic cover over permanent directory.
4. Bus Bars - All main bus bars shall be tin-plated copper sized in accordance with UL Standards to limit the temperature rise on any current carrying part to a maximum of 50 degrees C above air ambient of 40 degrees C maximum.

B. Lighting Panelboards (LP)
1. Definition - Lighting panelboards shall operate at 208Y/120 volt, 3 phase power. The panel may contain circuit breakers to power lighting and receptacles. The panel may contain breakers to power equipment other than lighting and receptacles.
2. Panelboard breakers shall be molded case, thermal magnetic trip, bolt-on connection, quick-make, quick-break, toggle handle circuit breakers. Two- and three-pole units shall be internal common trip type. Contacts shall be silver alloy.
3. Main circuit breakers shall be rated 22,000 A.I.C. or as indicated on the Drawings.
4. Panelboards for use at 240 volts AC maximum shall incorporate branch circuit breakers as shown or scheduled rated at 10k A.I.C. symmetrical at 240 volts.
5. Provide three handle padlock attachments for each, 1-pole, 2-pole, and 3-pole breakers.
6. Design Basis – Square D NQOD series.

C. Equipment Panelboard (PP)
1. Definition – Equipment panelboards are to operate on 480Y/277 volt, 3 phase power. Equipment panelboards shall not have a main circuit breaker larger than 225 amps. Equipment panelboards shall not have branch circuit breakers larger than 70 amps. The panel may contain circuit breakers to power lighting.
2. Panelboard Breakers - Molded case, thermal magnetic trip, bolt-on connection, quick-make, quick-break, toggle handle circuit breakers. Two- and three-pole units to be internal common trip type with silver alloy contacts.
3. Main Circuit Breakers - Rated at 22,000 A.I.C. or as indicated on the Drawings.

4. Panelboards for use at 480 or 600 volts AC maximum to incorporate branch circuit breakers as shown or scheduled rated at 25,000 A.I.C. symmetrical at 480 volts.
5. Design Basis - Square D Model NF series.

2.6 DISCONNECT AND SAFETY SWITCHES

A. Definitions
1. Disconnect Switches - Non-fusible switches.
2. Safety Switches - Fusible switches.

B. Characteristics
1. Heavy-duty type construction.
2. Number of poles shall be equal to the number of current carrying conductors.
3. Lockable in “off” or “open” and in the “on” or “closed” position.
4. Quick-make, quick-break switch mechanism.
5. Dual cover interlock to prevent opening of the switch door when handle is in the “on” position, and to prevent closing of switch mechanism with the door open. Provide a defeat mechanism.
6. Visible blade construction.
7. Single throw unless noted otherwise.
8. All main service safety switches shall come with an AR-type fuse rejection kit.
9. Manual transfer switch shall be triple pole, double throw, center position off, lockable.

C. Ratings
1. 600 volts for 480V systems and 240 volts for 208V systems. Ampere or horsepower rating as shown or required.
2. RMS symmetrical interrupting rating shall be 100,000 amperes for main service, 10,000 amperes otherwise.
3. Lugs shall be rated and U.L. listed for 60 degrees C and 75 degrees C wires.

D. Enclosures
1. U.L. listed.
2. NEMA 4X stainless steel for exterior and wet locations; NEMA 4X non-metallic for corrosive areas; NEMA 7 for hazardous locations; all others NEMA 12.
3. Provide with enclosure-mounted handle operator, operating through approximately 180-degree arc.

E. Fuses - Dual element RK1 current limiting type, time delay. Bussman Low-Peak LPN-RK or equal.

F. Manufacturers - Heavy-duty Square D Class 3110; ABB Type TH; Eaton Type H-600; or equal.

2.7 NAMEPLATES AND LABELS

A. Nameplates
   1. Material - Rigid laminated plastic.
   2. Lettering Height - 5/16-inch high.
   3. Lettering Color - White.
   4. Background Color - Black.

B. Labels
   1. Self-debossing, aluminum foil type.
   2. Typewritten or preprinted black legends on white background.
   3. Permanent Pressure-Sensitive Adhesive - Provide high temperature adhesive for labels on heat producing devices.
   4. Use preprinted sleeve type for conductors. Label at each termination or splice.
   5. Manufacturers - Seton or equal.

C. Equipment and Control Identification
   1. In addition to the requirements of the NEC, install an identification label which will clearly indicate information required for use and maintenance of items such as panelboards, cabinets, motor controllers (starters), motor control centers, VFDs, safety switches, separately enclosed circuit breakers, individual breakers and controllers in switchgear and motor control assemblies, control devices and other significant equipment.
   2. Provide nameplates for all electrical equipment and controls.
   3. Attach nameplates with stainless steel or other non-corrosive metallic rivets or screws.
   4. Provide a nameplate at each remote switch or control device when the controlled function is not readily identifiable.

   5. All wiring except major power conductors shall have each end of the conductor labeled. Label wires at each junction box.

D. Conduit Tags
   1. 1.5” diameter stainless steel tags with etched or embossed lettering. Provide stainless steel wire ties.
   2. Manufacturers – Brady or equal.

PART 3 – EXECUTION

3.1 CONDUIT INSTALLATION

A. Conduit System Fabrication
   1. All interior conduit shall be installed exposed. No conduit shall be in or under slabs except for building incoming/outgoing systems.
   2. No conduits within walls where the walls are below grade, i.e., in basements or galleries.

3. No conduit shall be run on the exterior face of any structure unless specifically shown exposed or approved by the Engineer prior to installation.
4. Conduit Defects - All conduit runs, cuts in coatings, to be free of indentations, elliptical sections, blisters, and other defects. Repair or replace damaged conduit sections as instructed by the Engineer.
5. Conduit Cutting - Cut all conduit ends square and remove all burrs. Cut conduit ends exactly to avoid excessive penetration into boxes.
6. Expansion Joints - Provide approved conduit expansion joints wherever conduit crosses a structural expansion joint; is attached between two separate structures; the conduit run is 50 feet or more in a single length for Types B, C, D, and D-1 conduit or 100 feet or more for Types A and E; or wherever shown or specified. Support conduit on each side of the expansion joint.
7. Preparation for Conductor Installation - Prior to pulling cables in any conduit system, thoroughly clean the inside of each length of conduit by swabbing or the use of compressed air to remove all foreign matter. Then temporarily plug the ends of each conduit to prevent the entrance of dirt or foreign matter.
8. Couplings
    a. Tightly butt ends of conduit into the couplings.
    b. In exposed work only, where standard couplings cannot be used, only union-type couplings are permitted or as otherwise acceptable to the Owner.
9. Cutting of Structures - Keep the cutting of walls or floors for conduit to a minimum. Where such cutting is absolutely necessary, take care so as not to weaken the walls or floor involved. Do not cut beams or other structural supports under any condition.
10. Connection to Devices - Conduit attachment to all electrical equipment, such as sheet steel junction boxes, pullboxes, switches, etc., to be made with approved fittings with non-metallic bushings.
11. Conduit Bends and Elbows
    a. Rigid Metallic Conduit Systems (Type E)
        1) Heating metal conduit to facilitate bending is strictly prohibited.
        2) Field bending metal conduit is permitted as follows:
    b. Type E - Up to and including 3/4-inch size.
        1) For all rigid metal conduit larger than that above, use manufactured elbows or use hydraulic one-shot bender to fabricate bends.
        2) Use manufactured elbows for all bends in Type E conduit systems.
        3) Make all bends with radius no less than NEC requirement.
        4) Apply PVC spray for all exposed threads, cuts, etc.
    c. Rigid Non-Metallic Systems (Type D)
        1) Join non-metallic conduit using cement as recommended by manufacturer. Wipe non-metallic conduit with appropriate cleaner, then dry before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

2) Field bending of Type D conduit is permitted only if a “hot box” is used.
3) Make all bends with radius no less than NEC requirement.
4) Kinked or crimped conduit bends are not acceptable. Remove and replace all such bends.

12. Routing of Conduits - Keep the number of bends, offsets, and crossovers to a minimum; however, not more than three 90-degree elbows or equivalent bends up to 270 degrees is to be installed in any run between pulling or access fittings.
13. Structural - Make holes around conduit or cables watertight or gastight via silicone or acrylic latex masonry sealant upon completion of conduit or cable system.

B. Conduit Size - Minimum conduit sizes shall be as follows unless specifically shown otherwise:
1. 3/4-inch for exposed locations (includes those areas above drop ceiling of lay-in tiles)
2. 1-inch for any concealed conduit in walls or within or beneath slabs.
3. 2-inch for any conduit in ductbanks (unless specifically shown otherwise).

C. Changes in Conduit Sizes - Made at pull or junction boxes except where specifically shown via a pull fitting.

D. Conduit and Sleeve Sealing
1. Seal inside of conduit (after installing and testing conductors) where passing through exterior walls or walls containing vapor seals or required to be gastight. Sealing may be accomplished by locating junction or approved sealing fitting at wall and filling with an approved waterproof electrical putty or sealing compound. Seal around all interior conduit passing through floor and wall boxouts.
2. Where driptight and watertight NEMA 4X and 12 installations are required, use only watertight hubs for top or side entry. Locknuts with gaskets are not acceptable. Conduits entering the top of electrical equipment are to either be sealed or located in such a manner as to prevent water from entering the equipment through the conduit system. Install conduit for ease of sealing.
3. Provide boxouts where conduit passes through poured-in-place concrete floors or walls. Core drill all other concrete walls, new or existing. Make cores 1-inch minimum, larger than O.D. of conduit.

E. Interior Walls
1. Non-Fire Rated Walls
a. Between Unclassified Areas
1) No Drop Ceiling or Below Drop Ceiling - Use core drilled holes.
2) Above Drop Ceiling
a) Air Handling Space - Core drill holes and seal around conduit.
b) Not Air Handling Space - Box out wall for conduits.
b. Between Classified or Classified/Unclassified Areas

1) Use core drilled hole. In masonry wall, seal with non-shrink grout to within 3/4-inch of wall face. Seal gastight and watertight with silicone acrylic latex masonry sealant. Fill hollow masonry voids with grout.
2) In concrete wall, seal around conduit with modular neoprene links and stainless steel compression bolts.

F. Access Fittings
1. May be used as required to facilitate installation of conductors or where shown.
2. Provide access fittings or conductors, as manufacturer recommends so as not to damage conductor or insulation during conductor pulling operations.

G. Pull and Junction Boxes - All pull and junction boxes shall be installed where shown or specified. Additional boxes may be installed as required to facilitate installation of conduit system.

3.2 CONDUCTOR INSTALLATION

A. Installation
1. Install products in accordance with manufacturers' instructions.
2. Do not pull thermoplastic wire at temperatures below 35 degrees F.
3. Protect exposed cable from damage.
4. Provide Kellem support grips when electrical cables hang in a vertical, sloping, or horizontal position.
4. Neatly train and lace wiring inside boxes, equipment, and panelboards.
5. Install electrical circuit loadings as designed on Contract Drawings unless approved otherwise by Engineer.
6. Where instrumentation cables are installed in panels, etc., the Contractor shall arrange wiring to provide maximum clearance between instrumentation cables and other conductors. Instrumentation cables shall not be installed in the same bundle with conductors of other circuits.
7. Intrinsically safe conductors shall be in separate conduits both inside and outside enclosure and shall be terminated on terminal strips with barriers. Barriers are to physically isolate intrinsically safe conductors from non-intrinsically safe conductors.
8. Installation in Concrete Manholes and Handholes - Neatly bundle conductors and train them around the outside (long way around) of the enclosure. Support conductors from hooks or cable supports inside of enclosure.

9. Wiring Diagrams
a. Any wiring diagrams shown on plans for hookup of equipment furnished by others are approximate and are for bidding purposes only.
b. Obtain wiring diagrams, certified correct for the job, from respective supplier for all equipment and systems furnished by them.
c. Install all work in accordance with certified wiring diagrams.

10. Electrical Trade to provide all power, control, and signal wiring and conduits between system components (including installation of any conductors supplied by other trades), including final connections to labeled terminal strips integral in equipment, as shown on Drawings, and in accordance with approved manufacturer's wiring diagrams. Exception is for certain HVAC conduit and wiring where specifically shown or specified to be by HVAC Trade.

B. Color Coding

1. Provide color coding for all service, feeder, branch, control, fire alarm, and signaling circuit conductors.
2. Grounded Conductor Color Coding in New Installations
   a. Ground – Green.
   b. Neutrals – White for 120V systems; gray for 277V systems.*

   *Exception - Where neutrals of more than one system are installed in the same raceway or box, each neutral shall be white or gray with a different colored (not green) stripe.

3. In addition to existing facilities, ungrounded conductors in different voltage systems shall match the existing system and/or be as follows:
   a. 120/208-volt, 3 phase: Phase A - Black
      120/240* Phase B - Red
      Phase C - Blue

      *For high ("wild" or red) leg delta system, the high leg shall be orange.
   b. 277/480-volt, 3 phase: Phase A - Brown
      Phase B - Orange
      Phase C - Yellow
   c. 120/208 or 120/240-volt, single phase: Red and black.
   d. DC Power - Positive Lead - Red.
      - Negative Lead - Black.
   e. DC Control - All blue.
   f. 120-volt Control Wiring - Single conductor AC control wire shall be red, except a wire entering a motor control center compartment or control panel which is an interlock shall be color coded yellow.
   g. 24-volt Control Wiring - Orange.
   h. Neutral (Grounded Conductor) - White or gray.

   Grounding Conductor - Green.

C. Conductor Sizing

1. Conductor sizes that are shown for equipment branch circuits are the minimum sizes allowed. Refer to schedule in paragraph 3.02.C.2.c. below for sizing conductors on circuits longer than the minimum length shown for the various voltages. Adjust conduit sizes accordingly.
2. Wiring shown without size to be sized by one of the following methods, whichever is larger. No additional payment will be made for oversized conduit or conductor.

a. Power and Lighting Circuits - Minimum size No. 12 AWG. Quantity as required for proper operation. Use 3/4-inch conduit types as required for the area where conduit is installed.
b. Control Circuits - Minimum size No. 14 AWG. Quantity as required for proper operation, use 3/4-inch conduit, type as required for the area where conduit is installed.
c. Increase minimum size conductors for 20 ampere single phase circuits where distance between power source and item served exceeds noted length in accordance with the following table. No more than 2 percent voltage drop of all branch circuits at equipment's rated full load current is permitted.

120 volts	100' to 150'	#10	151' to 225'	#8	226' up	#6
208/240 volts	100' to 175'	#10	175' to 250'	#8	251' up	#6
265/277 volts	125' to 200'	#10	201' to 300'	#8	301' up	#6
460/480 volts	225' to 350'	#10	351' to 525'	#8	526' up	#6

d. Minimum size of branch circuits over 20 amps per requirements of NEC Tables 310.16 thru 310.31.

3. Neutral Wire - To be equal to ungrounded wires unless otherwise shown.
4. Ground Wire - Minimum size as required by the NEC Table 250-122.

D. Spare Conductors - Wherever groups of control and instrumentation conductors are required, provide the following minimum numbers of spare conductors. As required, Contractor shall increase conduit sizes shown to accommodate spare conductors. Terminate at terminal strips on both ends and mark as spare and indicate the location of opposite end.

CONDUCTORS	SPARES
Up to 10	4
11 to 18	6
19 and over	8

3.3 CONDUCTOR STRANDING

A. All conductors shall be stranded except for interior lighting and receptacle circuits #10 and smaller.

3.4 CONNECTORS AND TERMINATIONS

A. Use manufacturer's standard lugs for connection of conductors to equipment panel or devices.

B. Use UL approved wire nuts for lighting and receptacle circuits and for other circuits, compression connectors for connection of conductors to other conductors.

C. Terminal Board Terminations - All interconnecting instrumentation wiring to terminal boards and strips to be made with insulated crimp type connectors (locking fork type). Stranded wire is not to be directly connected to terminals without the use of connectors unless the terminations are specifically made to accept bare stranded wire, i.e., tubular clamp type termination. No loose strands shall be permitted outside of the connector, whichever is utilized.

D. Motor Connections
   1. Motors Less Than 1 HP - Use wire nut appropriate for the environment where the motor is located.
   2. Motors From 1 to 20 HP - Use branch circuit crimp-type connectors.
   3. Motors Above 20 HP - Use bolted wire connectors. Insulate the connector with insulating putty to at least 7/64 inch and tape the insulated connection with two layers half lapped of neoprene splicing tape.

E. Splicing - Make splices in accessible locations and in junction boxes. No splices will be permitted in pulling fittings or MCC wiring spaces.

3.5 GROUNDING

A. Maintain electrical integrity of conduit system throughout. Provide bonding jumpers at fittings as required; jumpers to be no longer than required. Provide separate ground wire for all conduit systems and where grounding integrity is doubtful.

B. Basic intent of grounding specification is that grounding conductor be completely separate from system neutral and that neutral only be connected to ground at the main service grounding point. Run equipment ground independently back to main service ground. Use separate insulated (green) grounding conductors for all grounding conductors. Where ground passes through panels and disconnects, braze ground lugs to panel or disconnect housings. Isolate neutral bus or lug from ground. Ground all conduits at each panel.

C. Shielding to be continuous and grounded at one point only unless otherwise required by equipment manufacturer’s recommendations.

3.6 EQUIPMENT AND DEVICE MOUNTING HEIGHTS

A. Mounting heights are as follows, unless otherwise noted:

   1. Receptacles - 48 inches.
   2. Switches - 45 inches to the center.
   3. Thermostats - 54 inches.

4. Enclosed Starters or Circuit Breakers
    a. Wall Mounted - 66 inches to top.
    b. Interior Mounting Stand/Exterior Not on Tank – 36 inches to center of operating handle for equipment less than 60 inches high.
    c. Exterior Mounting on Tanks – 36 inches to center.
5. Control or Starter Panels - See Section 26 27 16, Control Panels and Enclosures.
6. Panelboards - 66 inches to top.
7. Disconnect Switches - See Section 26 27 16, Control Panels and Enclosures.

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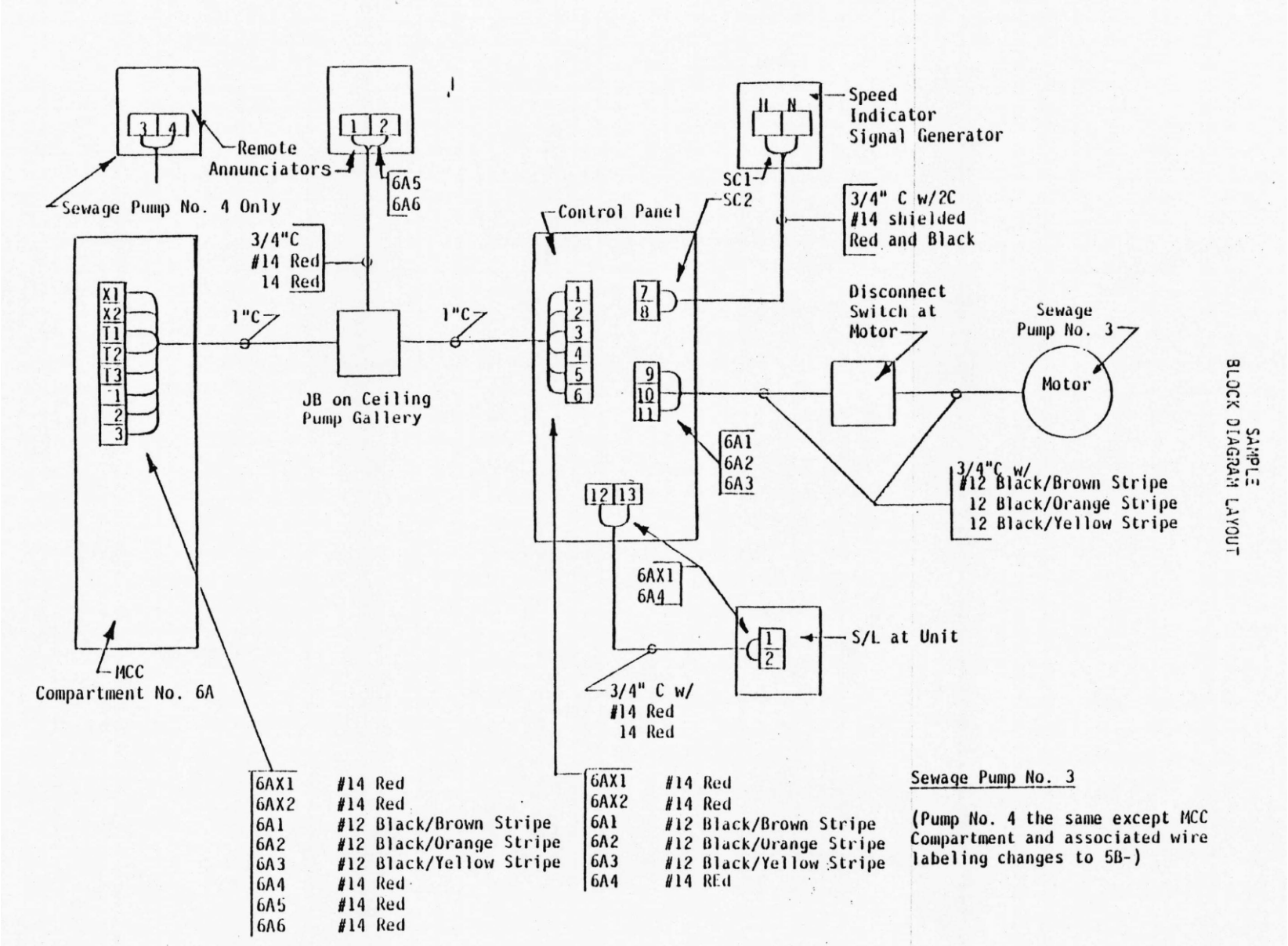

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SECTION 26 05 26

GROUNDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Items to be grounded include all new or modified work of this Contract, but not be limited to metallic water services, equipment housings, motor frames, metal raceways, bus duct enclosures, grounding terminals of outlets, outdoor lighting fixtures, footing rebar, ductbanks, manholes, pullboxes, and transformer secondary neutrals. In addition to the National Electrical Code (NEC) requirements and the above, the following, where a part of this project, shall be permanently and effectively grounded:
   1. All structural metals.
   2. All metallic panels and conduit.
   3. Motor frames.
   4. All metallic equipment bases.
   5. Metallic handrailing.

B. Take special precautions to ground all equipment in strict accordance with the NEC and as otherwise noted in these specifications.

1.2 RELATED SECTIONS

A. Section 26 05 00 - ELECTRICAL WORK

B. Section 26 08 00 - TESTING AND INSPECTION

1.3 REFERENCES

A. All materials and installations shall be in accordance with the latest revisions of the following:
   1. National Electrical Code
   2. Underwriters Laboratories, Inc.

1.4 SUBMITTALS

A. Provide submittals and samples in accordance with Sections 01 33 00, Submittal Procedures, and 26 05 00, Electrical Work..

B. Submitted for all materials used in connection with the grounding system.

C. Submit a 12-inch sample of the ground system rope-lay conductor and other samples as may be requested by the Engineer.

D. Certified test reports of grounding system resistance.

PART 2 - MATERIALS

2.1 ELECTRODES

A. Ground Rods – 5/8-inch diameter x 10 feet long (minimum) steel core copper jacketed. Rods shall be manufactured by Copperweld Steel Company, Thompson Lightning Protection, Inc., or equal.

B. System shall be UL listed.

C. System access from grade shall incorporate the use of a concrete or polyplastic box for protection with a steel cover. Box shall be installed flush with finish grade.

D. Manufacturers
   1. Superior Grounding Systems.
   2. XIT Grounding System or approved equal.

2.2 CONDUCTOR

A. Ground Conductor (Above Grade) - Type XHHW insulated wire in conduit or other raceway. Color code insulation per NEC.

B. Ground System Conductor (Buried) - Soft drawn of soft annealed stranded copper, tinned bare conductor woven to form "rope-lay" type.

C. Equipment Bonding Conductor - For sizes 8 AWG and smaller, solid ASTM B1. For sizes 6 AWG and larger, stranded ASTM B8.

2.3 CONNECTORS

A. Compression-Type Fittings
   1. Construction - Two bolts and a minimum of 1-1/2 inches in length.
   2. Manufacturers
      a. Thomas & Betts
      b. Burndy Corporation

B. Welded Connection
   1. Construction - Molded fusion-welding process.
   2. Manufacturers
      a. Cadweld
      b. Thermoweld

C. Mechanical Connection
   1. Construction - Mechanical lugs securely fastened using silicon bronze hardware.

2. Manufacturers
    a. Thomas & Betts
    b. Burndy Corporation

PART 2 - EXECUTION

2.1 GROUND SYSTEM DESCRIPTION

A. Install ground system or grid as shown on the Contract Drawings. Install such that tops of driven ground rods are a minimum of 12 inches below grade. Ground rods are to be driven at least 2 feet below the groundwater level. Depth of the conductor system is to be 30 inches minimum with a minimum length of .20 feet. Thermoweld rods to copper, rope-lay grounding conductor or use approved mechanical connections to rods where grounding conductor is No. 4 or smaller.

B. When rods are shown and cannot be driven due to boulders or rock formations, install grounding plates below groundwater level or a minimum of 6 feet below grade.

C. Final resistance to ground of completed ground system shall be a maximum of 5 ohms. If tests indicate higher than 5 ohms resistance, then the Contractor shall install additional rods or plates at no additional cost to Owner to lower the resistance to below 5 ohms.

2.2 CONNECTIONS

A. Buried Connection - Made with either thermal welded or compression fitting specially made for grounding systems

B. Exposed Connection - Made with grounding system compression-type fittings.

C. Connection to Metal - Make all connections to water pipes, steel surfaces, etc., using mechanical connectors.

D. Thoroughly clean all surfaces to bright bare metal to accept ground connections.

2.3 GROUNDING ELECTRODE CONDUCTOR

A. Size per NEC 250-66 unless larger size is shown or specified below:

2.4 BUILDING GROUND CONNECTION

A. Connection from main ground to building system shall be as specified herein and as required. Positively connect equipment housings and conduit system to main service ground, only at main service ground.

2.5 INDIVIDUAL GROUNDS

A. If individual equipment or individual building grounds are made, separate grounding conductors (in earth where possible) shall connect these grounds to main service ground. (This requirement applies only within each system of subsystem fed from a distribution transformer.) Intent is that main ground shall be at the main or incoming power source and not at utilization point unless positively connected to same.

2.6 INTERIOR CONDUIT AND RACEWAY SYSTEM

A. Electrical integrity of conduit system shall be maintained throughout. Provide bonding jumpers at fittings as required; jumpers shall be no longer than required. Provide separate ground wire for all conduit systems.

2.7 EXTERIOR CONDUIT AND RACEWAY SYSTEM

A. Provide separate ground wire for all conduit systems leaving the building interior. Size per NEC 250-122 in NEC.

2.8 FEEDERS

A. Include an insulated grounding conductor, sized per NEC 250-66, in each conduit. Bond all served equipment frames, enclosures, ground bars, etc., to this conductor. Make all conductor terminations and connections using compression lugs or fittings designed and UL labeled for the purposes.

2.9 SEPARATE GROUND

A. Basic intent of grounding specification is that grounding conductor be completely separate from system neutral and connect neutral to ground at the main service grounding point only. Run separate insulated (green) grounding conductors from all grounding points independently back to main service ground. Where ground passes through panels and disconnects, ground lugs shall be brazed or bolted to panel or disconnect housings with neutral bus or lug isolated from same. Ground all metallic conduits at each panel. Clean paint from metal to accept ground lugs.

2.10 METALLIC, NON-CURRENT CARRYING ENCLOSURE

A. Connect to ground bar at load center supplying same through conduit system using proper fittings at junction boxes, expansion joints, and between ground bushings on each conduit within all sheetmetal enclosures.

2.11 SHIELDED CABLE

A. Shielding to be continuous and grounded at one point only unless otherwise required by equipment manufacturer's recommendations.

2.12 CONDUIT SEALS

A. Where non-metallic conduits protecting grounding conductors enter the building from the exterior, provide watertight wall seals on each conduit and a sealing bushing on the enclosed conductor. Sealing bushings on all conduits penetrating the floor. Make bonding jumper connection to metallic conduit, where equipped with sealing bushings, with water pipe ground connections of proper size. Seal watertight the inside of all conduits.

2.13 GROUND CONDUIT LABELS

A. Label all service, equipment frame or motor grounding conduits containing only grounding conductors "_____ Ground." Label to identify item being grounded.

2.14 INDIVIDUAL MOTOR CONNECTION

A. Make connections from frames of motors over 50 HP directly to the exterior/buried ground system. Motors up to this HP shall be connected to the circuit or raceway grounding system. Where motor is separate from and not mounted on a major equipment frame, bond frame to motor ground.

2.15 MAJOR EQUIPMENT FRAMES

A. Make connection from major equipment frame, i.e., belt dewatering equipment, mechanical screens or grit equipment, directly to the exterior/buried ground system. Conductor shall be installed in conduit and full length from the grounded item to outside below grade.

2.16 CONCRETE MANHOLES

A. Provide one 5/8-inch diameter by 10-foot long ground rod in or at each manhole.

B. Provide No. 6 ground conductor from ground rod to all metallic parts including cable racks and manhole frame.

C. Bond ductbank grounds to manhole ground rod.

2.17 DUCTBANK GROUND CONDUCTOR

A. Bond ductbank ground conductor when a new building ground system was not provided, install a new ground road and bond the ductbank ground conductor to it.

B. Bond ductbank grounds to manhole ground rod, if available.

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SECTION 26 05 29

ELECTRICAL SUPPORTS, ANCHORS AND FASTENERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.2 REFERENCES

A. NECA - National Electrical Contractors Association.

B. ANSI/NFPA 70 - National Electrical Code.

1.3 RELATED SECTIONS

A. General Clauses

B. Section 26 05 00 – Electrical Work

1.4 SUBMITTALS

A. Manufacturer’s Instructions - Indicate application conditions and limitations of use stipulated by Product testing agency specified under Article 1.05. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or other third-party testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Materials and Finishes - Provide products which incorporate corrosion resistance adequate for the conditions in which they are to be installed.

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products and designing system supports.

2.2 STEEL CHANNEL

A. Non-PVC Coated
   1. Ductile Iron
      a. Description - Hot dipped galvanized steel channel designed for use with steel fittings, spring backed washers and nuts.
      b. Manufacturers
         1) Kindorf.
         2) Uni-Strut.
         3) B-Line.
         4) Globe.
   2. Stainless Steel
      a. Description - For the purpose of this Section, all stainless steel shall be Type 316.
      b. All fasteners, fittings, clamps, saddles and accessories shall be stainless steel.
      c. Manufacturer
         1) Uni-Strut.
         2) B-Line.

B. Polyvinyl Chloride (PVC) Coated Materials
   1. Hanger or support shall be hot dipped galvanized including the threads.
   2. The zinc surface shall be treated with chromic acid prior to coating to enhance the bond between metal and plastic.
   3. All surfaces shall be coated with an epoxy acrylic primer of approximately 0.0005-inch thickness.
   4. The PVC coating shall be applied by the liquid fluidized bed method.
   5. The coating material shall be compounded of pure materials and shall be free of any fillers or secondary plasticizers or gross, non-uniform characteristics.
   6. A PVC coating shall be bonded to the galvanized outer surface of the product. The bond between the PVC coating and the product surface shall be greater than the tensile strength of the plastic. The thickness of the PVC coating shall be a minimum of 0.040-inch (40 mils) and a maximum thickness of 0.045-inch (45 mils).
   7. Finished Color - Manufacturer’s standard.
   8. Manufacturers
      a. B-Line Systems, Inc.
      b. Perma-Cote Industries.
      c. Occidental Coating Company (OCAL).
      d. Robroy Industries (Plasti-Bond Red).
      e. Kor Kap.

2.3 TWO-PIECE MALLEABLE IRON CLAMPS

A. Cast malleable iron or stainless steel strap clamp sized to match conduit with mating malleable iron clamp backs (spacers). Clamp back shall be thick enough to provide 1/4-inch standoff from conduit to wall. Cadmium-plated anchor and washer. Manufacturer - O-Z/Gedney, Thomas & Betts, Appleton, Raco, or equal.

B. PVC coated cast malleable iron strap clamp sized to match conduit with mating malleable iron clamp back (spacer). Clamp back shall be thick enough to provide 1/4-inch standoff from conduit to wall. Stainless steel anchor and washer. Manufacturer - Robroy, Thomas & Betts, Ocal, Perma-Cote Industries, Kor Kap, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General
   1. Install products in accordance with manufacturer's instructions.
   2. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit. Anchor conduits to or support from structural members only.
   3. Fasteners used to wall mount any material or equipment weighing 75 lbs or more to concrete or masonry shall be adhesive grouted Type 316 stainless steel anchors. All floor-mounted equipment and other wall-mounted materials or equipment weighing less than 75 lbs may be supported via drilled anchors.
   4. Do not use spring steel clips and clamps.
   5. Do not use powder-actuated anchors.
   6. Do not drill or cut structural members.
   7. Install supports in a manner that does not interfere with or weaken the bolts when attaching to structural steel. Obtain the Engineer's written approval of any drilling or cutting on the structure.
   8. Through spaces where surface mounting is not available, install multiple conduits on electrical channel rack, either hung or wall mounted. Provide space on each rack for 25 percent additional conduits.
   9. All hung systems with conduits 3-inch or larger shall also have lateral seismic supports at each hanger.
   10. Support conduit passing through above-grade floors so that sealing sleeves or mechanical link seals do not carry the weight of the conduit.
   11. Secure conduit installed in poured-in-place concrete to reinforcing bars with tie wires. Install suitable brackets secured to forms in the absence of reinforcing bars.
   12. Install individual surface-mounted conduit with two-piece cast malleable iron clamp assembly.
   13. Install surface-mounted cabinets and panelboards with minimum of four or six anchors, depending upon the number of normal anchor points. See table at the end of this section.
   14. In wet and damp locations use PVC-coated steel channel supports to stand cabinets, panelboards and mounting panels 1/2-inch (12 mm) off wall.

15. Finish of all supports shall be compatible with the conduit system applicable for the area classification where installed.
16. After thorough investigation of architectural, structural and shop drawings related to work to determine how equipment, fixtures, conduit, panelboards, etc. are to be supported, mounted or suspended, provide:
    a. Extra steel bolts, inserts, pipe stands, brackets, or any other items required for proper support.
    b. Supporting accessories where required, whether or not shown on Drawings.
17. Refer to details on the Contract Drawings for free standing and railing mounted construction and for any other details of special conditions. For other situations, the Contractor shall, prior to installation, submit mounting details to the Engineer for approval.
18. Fasteners, brackets and supports shall be fabricated in accordance with Section 05500, Miscellaneous Fabrications, and as specified herein.
19. Coat field cuts of PVC-coated support members with matching PVC material to thickness of system coating. File smooth all cuts prior to coating.

B. In areas where spray insulation is to be applied, install steel channel standoffs for electrical conduit, boxes and enclosures prior to installation of insulation.

   Provide conduit extensions to all boxes and enclosures. Install connecting conduit, boxes and/or enclosures over the installed insulation.

C. Support Applications
   1. Unclassified Areas - Galvanized steel channel system or malleable iron clamps.
   2. Interior Corrosive Areas - Fiberglass reinforced plastic channel system.
   3. Interior Polymer Areas - PVC-coated galvanized steel channel system.
   4. Interior Wet Areas - Stainless steel channel system.
   5. Hazardous Areas - PVC-coated galvanized steel channel system.
   6. Exterior Areas - Stainless steel channel system.

D. Anchor and Fastener Application Schedule - See schedule at end of this section.

E. Support Spacing
   1. Metallic Conduit - Not more than 8 feet on center. Types A, A-1, B, E, E-1 within 3 feet of each outlet box, junction box, cabinet or fitting. Type C, within 18 inches of box or fitting. Support boxes, fittings, or cabinets independent of conduit system.
   2. Non-Metallic Conduit
      a. Sizes up through 1-1/4-inches diameter - not more than 3 feet on center.
      b. Sizes 1-1/2-inches diameter and larger - Not more than 4 feet on center.
      c. Within 18 inches of each outlet box, junction box, cabinet or fitting.
   3. Maximum Deflection
      a. Metallic Conduit - 1/100th of span between supports.
      b. PVC Conduit - 1/360th of span between supports.

ANCHOR AND FASTENER APPLICATION SCHEDULE

item category	mounting surfaces					
	wood, plywood	wallboard, gypsum, frp, composition	hollow masonry	solid masonry	cast concrete	sheet metal
Individual conduit	F	G	D	A	A	E
Steel/FRP channel	F, I	D	D	A	A	E
Structures; i.e., conduit rack, cable tray	F, I	D	D	A	A	--
Devices and equipment less than 75 lbs.	I	Note 1	D	A	A	Note 2
Devices and equipment 75 lbs. or more (Note 4)	I	Note 2	H	B, H	B, C, H	Note 2
Mounting panels (Note 3)	I	Note 1	D	B, H	B, C, H	Note 2

Key to Anchor Types:

A - Drilled (lead insert in masonry, expansion bolt in concrete)
B - Adhesive grouted anchor
C - Cast in place insert
D - Toggle bolt, hollow wall fastener
E - Sheet metal screw
F - Wood screw
G - Sheet rock screw
H - Through bolt
I- Lag screw

In wet, exterior, corrosive, or hazardous areas, all fasteners and anchors shall be Type 316 stainless steel. In all unclassified areas, cadmium-plated fasteners shall be used, except grouted anchors shall be Type 316 stainless steel.

Notes:

(1) Support via plywood mounting panel lagged to studs or via electrical channel lagged to studs.
(2) Do not mount to these surfaces.
(3) Panels mounted to masonry or concrete surfaces shall have 1/2-inch air space between surface and panel via stainless steel spacers.
(4) Provide two additional support connections; minimum of four or six, depending on number of normal connection points. This requirement may necessitate fabricating the additional connections. Maintain NEMA rating of enclosure.

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SECTION 26 08 00

TESTING AND INSPECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electrical power distribution and control circuit testing.

1.2 RELATED SECTIONS

A. General Clauses

B. Section 26 05 00 - ELECTRICAL WORK

1.3 SUBMITTALS

A. Made in accordance with Sections 26 05 00, Electrical Work, and as specified herein.

B. Submit test records and reports for all testing.

1.4 CERTIFICATION OF TESTING

A. Perform all tests in the presence of a duly authorized representative of the Owner unless waived in writing by the Engineer. When the presence of such representative is so waived, certified results of the tests made and the results thereof shall be furnished by the Contractor.

B. Perform all tests in the presence of the Engineer. Give the Engineer written notice of all tests at least two weeks in advance.

1.5 TEST EQUIPMENT

A. Furnish all instruments and a qualified engineer to properly perform all tests required.

1.6 FACTORY-TRAINED SUPERVISION

A. Provide necessary factory trained supervision to check over equipment for proper functioning before putting the equipment into operation as may be required by these specifications. This shall include establishing a simulated fault on checking out the coordination of the protective devices.

B. Make necessary adjustments and testing in cooperation with the respective manufacturers and other Contractors when necessary. Perform all tests in accordance with the latest standards of the ANSI, IPCEA, IEEE and NEMA.

1.7 COSTS

A. Costs of all tests shall be borne by the Contractor and shall be included in the contract price.

1.8 DAMAGES

A. If damage is indicated or observed during testing or from the review of tabulated data, replace defective or damaged materials and retest at no cost to the Owner.

PART 2 - MATERIALS

2.1 TESTING EQUIPMENT

A. Furnish all test equipment required to correctly perform the system tests.

2.2 SPECIAL EQUIPMENT REQUIREMENTS

A. 500-volt dc Megger - For maximum 300-volt systems.

B. 1,000-volt dc Megger - For maximum 600-volt systems.

PART 3- EXECUTION

3.1 GENERAL

A. After completion of the work, thoroughly test the entire electrical system, including electrical work required for instrumentation, control and power, and adjust electrical system as required.

B. Test all electrical circuits to insure circuit continuity, insulation resistance, proper splicing, and freedom from improper grounds.

C. System performance test runs are required. Coordinate test runs of electrical systems with test runs of equipment served thereby (i.e., mechanical, heating, air conditioning, process systems and plumbing).

3.2 GENERAL TESTING METHODS

A. Panels - Test each panel with mains disconnected from the feeder, branches connected, branch circuit breakers closed, all fixtures in place and permanently

connected, lamps removed or omitted from the sockets, and all wall switches closed.

B. Feeders - Test with the feeders disconnected from the panels.

C. Individual Power Circuits - Test each individual power circuit at the panel or motor control center with the power equipment connected for proper operation.

D. Transformers (Low Voltage) - Megohmmeter test all transformers in accordance with the manufacturer's recommendations.

E. Lighting and receptacle circuits do not need to be megger tested.

3.3 EQUIPMENT TESTING (600 volts and below)

A. Megohmmeter Tests
   1. Conduct megohmmeter tests of the insulation resistance of rotating machines and power distribution feeders down to panelboard feeders. The results will be accepted when the megger shows the insulation resistance to be not less than 50 megohms at 20 degrees C using either a 500-volt or 1,000-volt megger. Wait 1 minute between each test for all conductors in the same enclosure and each conductor and ground.
   2. Perform megohmmeter testing (Insulation Resistance Test) of all motor power and control wiring after the cables are in place and just prior to final terminations. Record all data as per Exhibit A. Lighting and receptacle panelboard branch circuits are not megohmmeter tested.

B. Voltage and Amperage Testing
   1. Check all single and three phase motor amperage while the unit is running at as close to operating load as possible. Record voltage on each line and the amp draw for each leg. Provide results in a typed report format and submit as part of the Contractor's closeout package.
   2. Check the load current in each phase of each distribution, lighting and receptacle panelboard feeder and make modifications to the circuit loading to correct load unbalance to within 1 kVA phase to phase for each panelboard.

3.4 GROUNDING SYSTEM

A. Test the grounding system to verify a resistance to ground of 5 ohms or less. If the resistance is greater than 5 ohms, modifications shall be made to the system by adding additional ground rods or plates to bring the resistance test value to 5 ohms or less. Submit a record/report to the Engineer. Include the following:
   1. Time, date, temperature, frost information depth (if applicable), and weather conditions.
   2. Moisture content of earth at time of measurement (wet, dry, etc.).
   3. Ground test equipment, model numbers, and last date of calibration.
   4. Detailed description of method used.

5. Plot of “distance from ground grid versus resistance.” Resistances shall range from 0-50 ohms with enough points to produce a smooth curve.
6. Maintenance information and recommendations (if applicable).

B. Test all grounding conductors and grounding systems for continuity. Where continuity does not exist, conditions will be corrected by an approved method and the system retested.

3.5 SYSTEM LOAD BALANCING

A. Check the load current in each phase of each distribution panel feeder and make modifications to the circuit loading to correct load unbalance to within 1 kVA phase to phase for distribution panels.

3.6 SYSTEM CHECKS

A. Preliminary
1. Connect all motors to protective devices and controls to give proper motor acceleration and correct motor rotation. Interconnect the control wiring to all the control devices associated with a machine, a group of machines, or other device to produce the correct operation, timing, and/or sequencing of the equipment.
2. Adjust overload elements in motor starters and check for coordination with the actual installed motor characteristics. Replace any overload element that is inadequate.
3. Check all motor nameplates for verification of proper voltage, horsepower, speed, phase, and power factor.

B. Operational
1. Then give the equipment an operational test to determine that all components including motors, controls, protective and switching devices, and auxiliary associated equipment are in operable condition and can function as described and shown on relevant specifications, operating instructions, and drawings.
2. Take motor current reading at full load or as close to full load as the driven machine will develop. If the ammeter reading is over the rated full load current or the proper current for the load at which the machine was operated, determine the reason for the discrepancy and take the necessary corrective action.
3. Remove the cause of any motor operating above full load rating instead of increasing the overload relay trip rating.

3.7 CLOSEOUT PROCEDURES

A. General - Sequence closeout procedures so that work will not be endangered or damaged, and so that every required performance will be fully tested and demonstrated.

B. Final Operational Check - Make a check of each item in each system to determine that it is set for proper operation. With the Engineer present, operate each system in a test run of appropriate duration to demonstrate compliance with performance requirements. During the following test runs, make final corrections or adjustments of systems to refine and improve performances where possible, including noise and vibration reductions, elimination of hazards, better response of controls, signals and alarms, and similar system performance improvements. Provide testing or inspection devices to permit observation of actual system performances and shall demonstrate that controls and items requiring service or maintenance are accessible.

C. Cleaning and Lubrication - After final performance test run of each electrical system, clean system both externally and internally, comply with manufacturer's instructions for lubrication of both power and hand operated equipment, and remove excess lubrication, touch up minor damage to factory-painted finishes and other painting specified as electrical work, and refinish work where damage is extensive.

D. Operating Instructions - General operating instructions are required. In addition to specific training of the Owner's operating personnel specified in the individual sections, and in addition to preparation of written operating instructions and compiled maintenance manuals specified elsewhere in these specifications, provide general operating instructions for each operational system and equipment item of electrical work, and coordinate instructions with instructions for mechanical work, and other equipment where associated with electrical systems or equipment.

E. System Description and Operation
   1. Perform in the presence of the Owner, the Owner's operating personnel and the Engineer.
   2. Describe each basic electrical system and explain identification system, displayed diagrams, signals, alarms and audio visual provisions.
   3. Describe interfaces with mechanical equipment, including interlocks, sequencing, startup, shutdown, emergency, safety, system failure, security, and similar provisions.
   4. In the presence of the Owner's personnel, display and conduct a "thumb-through" explanation of maintenance manuals, record drawings, spare parts inventory, storage and extra materials, meter readings, and similar service items.

3.8 CONTINUED SYSTEM OPERATIONS SUPPORT

A. Coordinate the Owner's takeover of electrical systems with takeover of mechanical systems, including the provision of skilled electrical operating and maintenance personnel until the time the Owner's personnel take over operation of entire mechanical and electrical plant. Respond promptly with continued consultation and services (beyond takeover date) on electrical systems, matching required continued services on associated mechanical systems and equipment until the end of the warranty period.

3.9 DOCUMENTATION PROCEDURE

A. Signed commitments are required. The transfer of electrical systems to the Owner for operation will not proceed until guarantees, warranties, performance certifications, maintenance agreements and similar commitments to be signed by Contractor and other entities have been executed and transmitted to and accepted by the Engineer for placement in the Owner's records.

3.10 THERMOGRAPH INSPECTIONS

A. Perform thermograph inspections on all service terminations, subfeed terminations, major power splices, and motor terminations for motors 5 HP or larger. Testing on major power distribution equipment will be performed with the plant running at a minimum of 70 percent capacity or the highest load that can be operated. Testing on individual pieces of equipment will be performed while the unit is operational at rated load and has operated for at least 30 minutes for continuously operated equipment or near the end of a cycle for equipment that operates on/off. Loads shall be minimum of 40 percent of full load. Readings at overcurrent devices and starters will be for line and load; motors will be connections in motor terminal boxes; and for transformers, primary and secondary terminations. Provide a report of test results to the Owner including indication of any actions taken to resolve abnormal readings. See Exhibit B at the end of this section. All thermographic tests shall be reported on this form.

EXHIBIT A

TESTING AND INSPECTION

ELECTRICAL INSULATION TEST RECORD
INSULATION RESISTANCE TEST

EQUIP. I.D. CKT/MARK NO.	TEST VOLTAGE	PHASE TO GND. MEG OHMS				PHASE TO PHASE MEG OHMS						DATE TESTED
		A	B	C	N	A-B	A-N	B-C	B-N	C-A	C-N	

TEST EQUIPMENT CONTROL NO. _____ _____ _____

REMARKS: _____

_____

_____

PERFORMED BY: _____ DATE: _____

APPROVED BY: _____ DATE: _____
Test Engineer

EXHIBIT B

TESTING AND INSPECTION
THERMOGRAPHIC TERMINATION TEST

EQUIPMENT	AMBIENT(1)	LINE/PRIMARY			LOAD/SECONDARY			LOAD CONDITION (% OF FULL)	COMMENTS(2,3)
		1	2	3	1	2	3		

Thermograph Model _____

Date of Test _____ Conducted by _____

Outdoor Temperature _____ Room Temperature _____

Owner/Engineer Witness _____

(1) Ambient is the breaker case temperature, transformer winding temperature, or motor housing temperature. For bus or cabling, it shall be the temperature of the bus or cable a minimum of 24 inches from the splice or termination.

(2)

TEMPERATURE DIFFERENCE	CONDITION	ACTION
1°C to 3°C	Possible deficiency	Investigate, i.e., clean terminations/retorque
4°C to 15°C	Deficiency	Determine problem and repair; retest
16°C and above	Major deficiency	Immediate shutdown; determine problem and repair and retest

(3) Indicate any discrepancies the cause of any temperature differences and indicate action to be taken.

Test Parameters:

- Imaging equipment shall be capable of detecting a minimum temperature difference of 1 degree at 30 degrees C.
- Equipment shall detect and convert emitted radiation to a visual signal.
- Tests to be run during periods of maximum possible loading, but at least 40 percent of rated load.

+ + END OF SECTION + +

SECTION 26 09 16

AUXILIARY CONTROLS AND RELAYS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pushbutton.

B. Selector switches.

C. Indicating pilot lights.

D. Contact blocks.

E. Control power transformers.

F. Fuse blocks.

G. Limit switches.

H. Time delay relays.

I. Relays.

J. Intrinsically safe barriers.

K. Liquid level sensors (floats).

L. Door Contacts.

M. Smoke Detectors.

1.2 RELATED SECTIONS

A. General Clauses

B. Section 26 27 16 - CONTROL PANELS AND ENCLOSURES

1.3 REFERENCES

NEMA ICS 1	General Standards for Industrial Control Systems
NEMA ICS 2	Standards for Industrial Control Devices, Controllers and Assemblies
NEMA ICS 6	Enclosures for Industrial Controls and Systems
NEMA ST 1	Standard for Specialty Transformers (Except General Purpose Type)

1.4 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 33 00, Submittal Procedures.

B. Submit shop drawings to NEMA ICS 1 indicating control panel layouts, wiring connections and diagrams, dimensions, support points.

C. Submit product data under provisions of Section 01 33 00, Submittal Procedures.

D. Submit product data for each component specified. The submittal shall be included as part of the system in which the component is specified.

E. Submit manufacturer's installation instructions under provisions of Section 01 33 00, Submittal Procedures.

F. Submit samples as requested by the Engineer.

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of control equipment. Revise diagrams included in Drawings to reflect actual control device connections.

1.6 OPERATION AND MAINTENANCE DATA

A. Include instructions for adjusting and resetting time delay relays, timers, and counters.

B. Include recommended preventive maintenance procedures and materials.

1.7 QUALIFICATIONS

A. Manufacturer - Company specializing in manufacturing the products specified in this section with minimum 10 years' documented experience.

PART 2 - PRODUCTS

2.1 PILOT DEVICES

A. General
   1. Pilot devices shall include indicating light, pushbuttons, and selector switches.
   2. Heavy-duty, industrial type, construction.
   3. Area Classification
      a. Non-Classified Area Device Rating - NEMA 13 oil-tight.
      b. Wet Area or Exterior Device Rating - NEMA 4 and NEMA 13 oil-tight and watertight.
      c. Corrosive Area Device Rating - NEMA 4X, non-metallic.

d. Hazardous Area Device Rating - NEMA 7, explosionproof.

4. Provide extra large nameplates in accordance with Section 26 05 00, Electrical Work, for all door or enclosure front-mounted devices.
5. Controls and relays shall be by one manufacturer wherever possible.
6. Provide enclosure for field mounted devices and individual controls in accordance with Section 26 27 16, Control Panels and Enclosures.
7. 30-millimeter diameter.
8. Retaining ring and boot type.

B. Pushbuttons and Selector Switches (PB) and (SEL SW)
1. Lockout feature as indicated.
2. Color - Red for stop or terminate function; black for all others.
3. Operators
   a. Provide “gloved hand” knobs for selector switches.
   b. Provide “mushroom head” button on emergency stop pushbuttons.
4. Stackable contact blocks.
5. Devices shall be either momentary, maintained, spring return, push-pull, or other operational types as shown or otherwise specified.
6. Manufacturer NEMA 4 and 13 Oil and Water Tight - General Electric, Square D Type K.
7. Manufacturer NEMA 4X, Non-Metallic - Allen Bradley Type 800H, Square D Type SK.
8. Manufacturer NEMA 7, Explosionproof - Allen Bradley Type 800H, Crouse-Hinds Type EFS and Type EMP for panel-mounted units.

C. Indicating Pilot Lights (IL)
1. Glass or plastic lens.
2. 120-volt LED type.
3. Push-to-test type. When six or more pilot lights are used in control panels, a single lamp test switch can be used in lieu of all lamps being push-to-test.
4. Lens color shall be as follows:

FUNCTION	COLOR
Motor running	Green
Motor stopped	Red
Malfunction	Amber
Ready	White or Green

5. Manufacturers - General Electric, Square D, Crouse-Hinds, or Allen-Bradley.

2.2 CONTACT BLOCKS

A. Molded of an amorphous transparent polyamid material with high impact resistance and resistant to carbon tracking.

B. Contacts - Double break silver type rated at 10 amp at 120 VAC continuous.

2.3 CONTROL POWER TRANSFORMER (CPT)

A. Standard industrial control type, VA size as required for the powered load.

B. Dual voltage primary, with 120V ac, single phase secondary. All primary connections fused; size as required for the transformer.

C. Secondary control fuse with capacity for the control circuit indicated.

D. DIN-rail-mounted type in control panels.

E. Manufacturer - Square D, General Electric.

2.4 FUSE BLOCKS

A. General purpose Class H, K, and R phenolic fuse block for dual-element cartridge fuses.

B. DIN-rail mounted in control panels.

C. Manufacturer - Buchanan or equal.

2.5 LIMIT SWITCHES (LS)

A. Contacts - Silver-to-silver snap-acting where practicable and in all cases where the motion is slow.

B. Switches - Operated by levers, plungers, or pushrods, depending on the application.

C. Rollers - Provided where excessive wear due to a sliding action would result.

D. Manufacturer - General Electric Class CR215G, Square D Class 9007 Type C.

2.6 ELAPSED TIME METERS (ETM)

A. Minimum six-digit, non-resettable hour meter, panel mounted.

B. For operation on 120 volts.

C. Manufacturer - General Electric.

2.7 TIME DELAY RELAYS (TR)

A. Solid-state type with calibrated dial head or dip switch adjustment, encapsulated coil, snap-action switch assembly of number of poles indicated.

B. “On-Delay,” “Off-Delay,” or “On-Off Delay” dual head type as indicated; timing range intervals as shown or specified.

C. Bases shall have captive screws for locking fork solderless connectors, single tier design, with relay retainer clips.

D. Dust-tight construction.

E. Provide auxiliary contacts where indicated.

F. Contacts rated 10 amps resistive at 120 VAC.

G. Manufacturer - Diversified Electronics Series "TD;" Square D, Type JCK; Timemark 300 Series.

2.8 GENERAL PURPOSE CONTROL RELAYS (CR)

A. Units shall be plug-in type.

B. Only for use in manufactured or custom-built control panels.

C. Number of poles and arrangement as shown or specified.

D. Contacts
   1. Shall be rated 10 amps at 240 volts AC.
   2. Material shall be silver cadmium oxide.

E. Coils shall be rated continuous duty.

F. Sockets
   1. Supply with relay retainer clip.
   2. Terminal connections with captive screw to accept locking fork solderless connectors.
   3. Single tier design.

G. Manufacturers - Square D Company Class 8501 Type K relay and Type NR socket; Potter-Brumfield; or equal.

2.9 INDUSTRIAL CONTROL RELAYS (CR)

A. Industrial machine tool type.

B. Use - Shall be used to control equipment with power requirements, such as solenoid valves.

C. Contacts
   1. Double break field convertible.
   2. Rated 10 amps at 600 volts AC.
   3. Rated 5 amps at 250 volts DC.

D. Coil shall be encapsulated, continuously rated of the voltage rating indicated on the plans.

E. Number of poles as indicated on Contract Drawings, but not less than four.

F. Holding and Operating Mechanism
   1. Electrically held, electrically operated, General Electric Company CR-120A; Square D Company Class 8501, Type X; or equal.
   2. Mechanically held/electrically held relay with mechanically-held attachment.
   3. Time Delay - Pneumatic timer attachment for electrically-held delay; "on delay" or "off delay" as indicated on plans.

2.10 INTRINSICALLY-SAFE BARRIERS

A. Power supply, bistable input amplifier, intrinsically-safe for connections to passive devices located in hazardous areas.

B. Relay Output Stage - LED indicator type.

C. FM approved. Manufacturers: Pepperi & Fuchs WE Series, Square D, Class 8501.

2.11 LIQUID LEVEL SENSORS (FLOATS)

A. Contacts - A normally open, normally closed mechanical micro switch SPDT (single break) totally encapsulated in epoxy or polyurethane. Mercury switches are not acceptable.

B. Cable - Type STO or SJO cable of sufficient length (65 feet minimum length) to reach the first junction box with minimum conductor size of 19 AWG.

C. Sufficient excess cable shall be provided with each liquid level sensor to adjust its vertical position 1 foot± of its original setting.

D. Provide stainless steel mounting brackets to support all float switches.

E. Manufacturer - Flygt Model ENM-10, no exceptionns

2.12 DOOR CONTACTS

A. Magnetic door contact, surface mount, IP67, -40-150°F temp range, aluminum housing, 120VAC, normally open wide gap.

B. Manufacturer – Edwards Signaling Sentrol 2505A series, or equal.

C. Manufacturer – Edwards Signaling Sentrol 2845T series, or equal, for hazardous Class 1, Division 1, Group D areas.

2.13 SMOKE DETECTORS

A. GENTEX S1209F smoke detector with built-in Form C relay, 120VAC, integral 85 dBA horn, 9V battery backup, or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Mount all individual controls in a suitable enclosure as specified per Section 16161, Control Panels and Enclosures.

B. Identify all auxiliary controls per Section 26 05 00, Electrical Work.

C. General purpose control relays shall be used in manufactured or custom-built control panels. The Contractor shall use control relays as described in Article 2.09 to control equipment with power requirements, such as solenoid valves.

3.2 CONTROL POWER TRANSFORMER

A. Provide individual control power transformers for each control circuit.

B. Size as required by control circuit.

3.3 FUSE BLOCKS

A. Size as indicated on Drawings or as required.

3.4 LIMIT SWITCHES

A. Limit switches shall be provided where specified and where it is required to convert a mechanical motion into the control of an electric circuit.

3.5 PUSHBUTTONS AND SELECTOR SWITCHES

A. Units shall be back-mounted wherever possible.

3.6 FLOATS

A. Mount floats per the installation notes or details as shown on the Drawings.

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SECTION 26 27 13

ELECTRICAL UTILITY SERVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes arrangement with utility company for permanent electric service; payment of utility company charges for service; service provisions; and utility metering equipment.

1.2 SYSTEM DESCRIPTION

A. Utility Company - Consolidated Edison Company of New York. Contact: Mr. XX (914) 925-XXXX.

B. System Characteristics - 120/208 volts, three phase, four wire, 60 Hertz.

C. Weaver Street: 400A, 120/208 volts, three phase, four wire, 60 Hertz underground secondary from existing pole mounted utility transformer. Note: overhead primary pole line out to Weaver Street is customer owned by Westchester County.

1.3 SUBMITTALS

A. Submit utility company-prepared drawings.

B. Submit Engineer-approved shop drawings to utility company for their approval as required.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with utility company written requirements.

B. Maintain one copy of each document on site.

1.5 FIELD MEASUREMENTS

A. Verify field measurements are as indicated on utility company drawings.

1.6 COORDINATION

A. Coordinate with utility company, relocation of overhead or underground lines interfering with construction. Where power lines are to be temporarily relocated, bill utility costs, directly to Owner.

B. Contact utility company regarding charges related to service installation. Utility fees to be paid directly by the Owner.

1.7 REGULATORY REQUIREMENTS

A. Confirm to requirements NFPA 70.

B. Products - Listed and classified by Underwriters Laboratories, Inc., testing from acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.8 PRE-INSTALLATION MEETING

A. Convene at least one week prior to commencing work of this section. Review service entrance requirements and details with utility company representative.

PART 2 - PRODUCTS

2.1 UTILITY METERS

A. Furnished by utility company.

2.2 METERING CABINET

A. Manufacturers - Must be an utility-approved manufacturer.

B. Size - As required by utility.

C. Description - Sheet metal cabinet with hinged door conforming to utility company requirements, with provisions for locking and sealing with fused main service disconnect.

2.3 SERVICE ENTRANCE CONDUCTORS

A. Conductors shall be copper type USE-2/RHW-2 insulation as required by the utility company.

2.4 SERVICE ENTRANCE CONDUITS

A. Underground service entrance conduits shall be schedule 40, HDPE conduits as required by the utility company.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify service equipment is ready to be connected and energized.

3.2 EXISTING WORK

A. Remove exposed abandoned service entrance raceway and conductors, including abandoned components above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.

B. Disconnect abandoned service equipment and remove.

C. Maintain access to existing service equipment, boxes, metering equipment, and other installations remaining active and requiring access. Modify installation or provide access panel.

D. Extend existing service installations using materials and methods compatible with existing electrical installations, or as specified.

E. Clean and repair existing service equipment to remain or to be reinstalled.

3.3 INSTALLATION

A. Install metering cabinet at height in accordance with utility company requirements. Install drip loop in service conductors.

+ + END OF SECTION + +

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SECTION 26 27 16

CONTROL PANELS AND ENCLOSURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hinged cover enclosures.

B. Cabinets.

C. Terminal blocks.

D. Control stations.

E. Accessories.

1.2 RELATED SECTIONS

A. General Clauses

B. Section 26 05 00 - ELECTRICAL WORK

C. Section 26 05 29 - ELECTRICAL SUPPORTS, ANCHORS AND FASTENERS

D. Section 26 40 00 - OVERCURRENT PROTECTIVE DEVICES

E. Section 26 09 16 - AUXILIARY CONTROLS AND RELAYS

1.3 REFERENCES

NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 4	Terminal Blocks for Industrial Control Equipment and Systems
ANSI/NFPA 70	National Electrical Code
UL	Underwriters Laboratories, Inc.

1.4 SUBMITTALS

A. Submit under provisions of Sections 26 05 00, Electrical Work.

B. Submit shop drawings for all control panels. The submitted information shall be detailed specification information proving compliance to these specifications. Submittals shall include, but not be limited to, the following:

1. Enclosure information including size and NEMA classification.
2. Subpanel layout.
3. Wiring diagrams and elementaries.
4. Bill of materials.
5. Internal components (specification information, cut sheets).
6. List of nameplate titles.
7. Dimensions.

C. Shop drawings shall be submitted for all materials used as enclosures.

D. Submit equipment and material samples as requested by the Engineer.

E. Manufacturer's Instructions - Indicate application conditions and limitations of use stipulated by product testing agency specified under Article 1.06. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. The supplier of the station control panel enclosure at the Weaver St Pump Station shall provide detailed heating and cooling calculations. These calculations shall demonstrate sufficient heating and/or cooling capacity to maintain the enclosure temperature between 40 and 100 degrees F.

1.5 DEFINITIONS

A. Power Wiring - Shall mean conductors, conduit, wireway and connections, and related electrical work to supply electrical power to equipment, including electrical power to supply point for equipment control systems.

B. Control Wiring - Shall mean conductors, conduit, wireway, construction and related work to connect or interconnect relays, solenoids, contact devices, signal lights and audible signals, as well as any and all other electrical control devices indicated as related to the control functions.

C. Control Panel (CP) - Is an enclosure used to house logic or power devices such as CPT, starters, contactors, relays, timers, and may also contain pilot devices.

D. Control Station (CS) - Is an enclosure used to house pilot devices only, such as pushbuttons, indicating lights, and selector switches.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction, as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 MANUFACTURERS - NEMA 4 EPOXY COATED

A. Hoffman - Model Series EPLP

B. Appleton - Model ECH/ECHT

C. Or approved equal

2.2 MANUFACTURERS - NEMA 4X STAINLESS STEEL

A. Hoffman - Model Series SSLP

B. Hammond – 1418NA S.S. Series, wall mounted; 1422NA S.S. Series, floor mounted

C. Or approved equal

2.3 MANUFACTURERS - NEMA 4X NON-METALLIC

A. Carlon - Model “Himeline" Series HL

B. Hammond – “PJ” Series

C. Or approved equal

2.4 MANUFACTURERS - NEMA 7

A. Killark - Model “Quantum” Series EXB

B. Appleton - Model EXB

C. Or approved equal

2.5 MANUFACTURERS - NEMA 12 SINGLE DOOR

A. Hoffman - Model Series LP

B. Hammond – 1418 Series

C. Or approved equal

2.6 MANUFACTURERS - NEMA 12, TWO-DOOR AND FREE STANDING

A. Hoffman - Model Series ULP and FS

B. Hammond – 1418 Series

C. Or approved equal

2.7 SHEET METAL ENCLOSURE FABRICATION

A. After fabrication and assembly of all sheet metal enclosures, grind all welds smooth, and then thoroughly degrease and clean. Apply at least two coats of rust inhibiting primer or undercoat of the manufacturer's standard quality followed by at least two coats of baked enamel or epoxy finish. For exterior enclosures utilizing an epoxy finish, the enclosure shall have a final overcoat of clear acrylic polyurethane.

   Finish Color of All Enclosures - ANSI 61 Light Gray.

B. Turn back edges and file all sharp corners smooth.

C. Enclosure Opening
   1. Roll lips on all sides.
   2. Provide neoprene gasket.
   3. Provide drip shield kits for exterior enclosures.

D. Doors
   1. Rolled lips on unhinged sides (three sides).
   2. Full length piano type hinges.
   3. Provide all front or rear panel doors with door holders sized appropriately for the weight of the equipment on the door.
   4. NEMA 4X and 12 Door Latches - 1/4-turn handle.
   5. Hinged doors over 24 inches high shall have latching device at three points.
   6. Provide mechanical interlock between door and panel power disconnect mechanism. The interlock is to prevent the door from opening while the disconnect switch is closed. Provide an unlabeled defeater mechanism to permit qualified personnel access to panel while it is powered.

2.8 ACCESSORIES

A. Manufacturer - Cable Ties
   1. Thomas & Betts - Model Nylon TY-WRAPS.
   2. Burndy – Ty-Wrap.
   3. Or approved equal.

B. Manufacturer - Terminal Blocks
   1. Buchanan - Model 0241.
   2. Connectron - Model N553.
   3. Or approved equal.

C. Manufacturer - Wire Duct
   1. Stahlin Brothers - Model XT-Panel Channel.
   2. Panduit Corporation - Model Type E-Dark Grey.

3. Or approved equal.

D. Manufacturer - Grounding Terminals
   1. Burndy - Model OA4C-AB.
   2. Ilsco Corp.
   3. Or approved equal.

E. Provide one drawing pocket in the panel, minimum size 10 inches wide by 10 inches high by 1/2 inch deep, panel manufacturer's standard material and finish.

F. Power Disconnect Switch - Built in to flange of enclosure with door interlock. Through-the-door types will not be acceptable.

2.9 ENCLOSURE – HVAC

A. The station control panel enclosure at the Weaver St Pump Station shall be provided with heating, ventilating and/or air conditioning equipment as necessary. This equipment shall be sized to maintain a temperature above 40 degrees F and below 100 degrees F to accommodate the starters, VFDs and instrumentation located within the enclosure.

PART 3 EXECUTION

3.1 ELECTRICAL CONTROLS

A. Shall be in accordance with Section 26 09 16, Auxiliary Controls and Relays.

3.2 POWER CIRCUIT PROTECTIVE DEVICES

A. Shall be in accordance with Section 26 40 00, Overcurrent Protective Devices.

3.3 NAMEPLATES

A. Provide nameplates on the exterior of each enclosure identifying the application or function of the enclosed equipment.

B. Nameplates and labels per Section 26 05 00, Electrical Work.

3.4 EQUIPMENT HOUSING TYPES

A. Enclosure, Control Panel or Device Applications –When no type is shown or specified, provide stainless steel.
   1. Exterior Locations - NEMA 4 stainless steel
   2. Interior Wet Locations - NEMA 4 stainless steel
   3. Corrosive Areas - NEMA 4X stainless steel
   4. Hazardous Areas - NEMA 7
   5. All Other Areas - NEMA 12 painted

3.5 CONTROL PANEL CONNECTIONS

A. Regardless of who furnishes or installs the various panels, all are connected electrically by the electrical trade unless specifically shown or specified otherwise.

3.6 FINISH REPAIR

A. Repair damage to the factory. Depending on the extent of damage to the factory-finish and/or the closeness of the color match of any field-applied paint, a complete repainting may be ordered by the Owner at his discretion.

3.7 DOOR QUANTITY

A. Provide two doors if panel is larger than 36 inches wide.

3.8 CONTROLS AND ASSOCIATED CIRCUITRY

A. Each control panel shall contain all applicable disconnects, including a single main power disconnect (unless specifically shown otherwise on the drawings); motor circuit disconnect - one for each motor; necessary control pushbuttons; timers; relays; door interlock switches; indicator lights; selector switches; alarms; instruments and associated circuitry to monitor and control the associated equipment. Main power disconnect operating mechanisms shall be flange mounted not through the door.

3.9 CONTROL PANEL WIRING

A. Wire Type - See Section 26 05 00, Electrical Work.

B. Wire Duct - Used for wiring between devices that are mounted on the back panel of control panels.

C. Wire Bundling - Where it is not possible to run wire in wire duct, such as wire run from devices located in the back of a panel to devices mounted on the door of a panel, the wire is to be bundled. Wire lacing or twine is not acceptable.

Bundles are to be wrapped by a spiral plastic protective sheath. Secure bundles to the panel structure for a stable support with a spacing of no less than every 8 inches.

A wire bundle which must cross a hinge shall run along the hinge as far as possible or have a large loop in bundle and be secured at both ends so that the twisting is taken over the longest length of hinge possible. Wire shall not be split off from the bundle along this length.

D. Wiring and Termination Methods - Interior wiring to be point-to-point with no splices. All wiring from and to the control panel to be through terminals located in the panel. Solderless insulated crimp-type locking fork lugs shall be used for terminations to screw-type terminals. Where screw-type terminals are not used, terminals shall be of the tubular clamp type. Install lugs such that no uninsulated wire is visible at the wire entry point, and wire strands are visible but not protruding from the screw connections end. Use solderless connectors or tubular clamp connectors for all connections to terminals and equipment.

E. Shielded Wire - Separate from other wires and equipment with suitable barriers and with terminal blocks for continuous shield grounding to the connecting cables.

F. Separate intrinsically safe wiring from all other wiring with barriers.

G. Furnish panels factory-wired and tested with all equipment and appurtenances mounted thereon.

H. Wire Labeling - Mark wires at both ends with numbers from Engineer-approved elementaries per Section 26 05 00, Electrical Work.

Color coding per Section 26 05 00, Electrical Work.

I. Panel Wiring - All panel wiring shall be installed by the panel manufacturer.

J. Lamp Test Switch – For panels with more than five indicating lights. Provide a single lamp test switch in lieu of push-to-test type indicating light.

3.10 TERMINAL BLOCKS

A. Arrange terminals in alphabetic and numeric order in columns on removable subplates. Locate columns at least 4 inches from any edge of the subplate and space 6-inch on centers and at least 2 inches from a wiring duct.

B. Provide marked terminals with wire number from Engineer-approved elementaries. Locate terminals with the same wire number adjacent to each other and jumpered.

C. Make a maximum of two connections to each side of a terminal, including jumpers.

D. Provide an additional 20 percent spare terminals with the following as minimum requirements:
   1. Power Terminals - Two spares.
   2. Control Terminals - Ten spares.

E. At least one position on a terminal block must be reserved for termination of each incoming wire. Locate all such positions on the same side of the column

of terminals. A wiring duct to feed the terminals must be sized to include wires for these positions.

F. Connect all ground terminals of power receptacles solidly to the frame of the panel. Provide the panel with one grounding terminal in the control panel. Mount grounding terminals to the frame of the panel or rack.

3.11 WIRING DUCT

A. Size wiring duct at 60 percent fill according to the maximum number of wires at any cross section, including field wiring terminations and spares. Wiring duct must be plastic.

3.12 CONTROL PANEL INSTALLATION

A. Wall mount panel enclosures that are up to 48 inches in height; floor mount larger panel enclosures, unless otherwise noted on drawings.

B. Furnish control panels, where shown, with power disconnect switches which will de-energize the power supply to the panel.

C. Ground Panels - Connect all equipment and circuits in the panels shown or required to be grounded to the grounding conductors.

D. Install panels where shown. Provide conduit entry as required for the installation.

E. Upon completion of installation, the equipment manufacturer's representative shall check panels and make necessary adjustments.

F. Panel manufacturer to mount all equipment shown or specified to be furnished with a panel. Furnish panels as completely assembled units.

G. For all wall-mounted panels, provide a minimum of four brackets designed for wall mounting.

3.13 MOUNTING HEIGHT

A. Mount control panels such that:

B. No disconnect handle is higher than 6 feet to the highest part of handle. Mount all separately enclosed circuit breaker and disconnect switch handles 4 feet 6 inches from floor or other working surface unless otherwise indicated (5 feet to the top of enclosure).

C. Top of wall-mounted enclosures shall not be higher than 5 feet 6 inches.

D. No pilot device is higher than 5 feet.

E. No operator interface device (i.e., graphic display screen, etc.) is higher than 4 feet 6 inches to the centerline of the device.

3.14 ENCLOSURE INSTALLATION METHODS

A. Support - Adequately support all enclosures from walls, structure, or on support panels or plates independently of the conduit system. Provide additional supports for seismic restraint.

B. Support Material - Size fasteners utilizing a safety factor of 5.

C. Mounting Accessories - Section 26 05 29, Electrical Supports, Anchors, and Fasteners.

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SECTION 26 29 13

CONTACTORS AND MOTOR STARTING EQUIPMENT

PART 1 GENERAL

1.01. SECTION INCLUDES

A. Manual motor starters and switches.

B. Motor starters.

C. Magnetic contactors.

1.02. REFERENCES

A. UL listing is required for all factory-fabricated assemblies. Individual component listing is also required.

B. Size equipment per NEMA and UL standards to match motor or equipment controlled.

C. The following specifications and standards, except as hereinafter modified, are incorporated herein by reference and form a part of this specification to the extent indicated by the references thereto. The issue in effect at time of construction shall be applicable. In text, such specifications and standards are referred to by basic designation only.
   1. National Electric Code (NEC).
   2. Underwriters Laboratories, Inc. (UL) - UL-508.
   3. National Electrical Manufacturers Association (NEMA)
      a. NEMA-1C-1
      b. NEMA AB-1 - Molded Case Circuit Breakers
   4. American National Standards Institute (ANSI).
   5. J.I.C. Standards for Industrial Control.

1.03. SUBMITTALS

A. Submittals shall be made in accordance with Sections 013300, Submittals, and 260500, Electrical Work.

B. Shop drawings shall be submitted for all starters and contactors. The submittal shall contain all the information needed to prove conformance with these specifications.

C. Submit elementaries and block diagrams for systems of relays and/or contactors.

D. Samples shall be submitted as may be requested by the Engineer.

1.04. QUALITY ASSURANCE

A. Perform work in accordance with NECA Standard of Installation.

1.05. QUALIFICATIONS

A. Manufacturer - Company specializing in manufacturing the products specified in this section with minimum 10 years' documented experience.

1.06. REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or a testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.01. GENERAL

A. All equipment furnished shall be of one approved manufacturer where possible. Manufacturers are General Electric Company, Square D Company, Cutler-Hammer, or equal.

B. For control panels with motors less than 1/2 HP, starters may be IEC rated motor protective switches. All other starters shall be NEMA rated starters.

C. Construction
   1. Parts easily removable when subject to wear, arcing damage, or electrical failure.
   2. Enclosures - Cold rolled, formed seam-welded steel or cast aluminum with suitable legend plates and NEMA enclosures as per Section 26 27 16, Control Panels and Enclosures.
   3. Overload Protection
      a. Magnetic Starters
         1) Melting Alloy or Bi-metal - For all motors including those with internal protection, of proper size to match the controller. One sensing device per ungrounded motor lead. Exception: Windings used only during motor starting and automatically disconnected when the motor is running may be unprotected. Units shall be "standard," "slow," or "fast" response as required for the type motor and load per the suppliers' recommendations. Size heaters per manufacturer's table supplied with the starter for the actual motor full load current and enclosure indicated on the motor nameplates. Temperature compensating motor starter overloads where or when required.
         2) Solid State - Overload relay, self powered, current sensing, phase unbalance and phase loss protection, NC standard trip contacts, visible trip indication, trip test function, power LED. Provide auxiliary NO contact (convertible to NC). Adjust solid state overload settings to match motor manufacturers nameplate motor data.
         3) Manufacturers - Square D, Allen-Bradley, or equal.
      b. Manual Starters - Thermal overloads in each phase leg or one for each motor winding. Use Type A for fractional horsepower and Type B for integral horsepower applications.

4. Auxiliary Contacts - Rated as required by interlocking and/or automatic control systems as indicated in these specifications and/or on the Contract Drawings. Minimum 2 NO and 2 NC auxiliary contacts required.

2.02. MANUAL STARTERS

A. General
1. Contact Mechanism - Quick make, quick break toggle action.
2. Contactors - Silver alloy.
3. Enclosures - Adequately sized to contain the starter and all accessories and/or modification. NEMA classification to meet requirements of Section 16161, Control Panels and Enclosures.

B. Fractional HP Type
1. Two-pole (unless shown or specified otherwise).
2. Toggle operated (unless shown or specified otherwise).
3. Full voltage.
4. Shall be non-reversing, reversing or two-speed as shown or specified.
5. Thermal overload device for each phase or motor winding.
6. Lock-off provisions and neon pilot light.
7. Selector switch as required, labeled for function performed.
8. General Electric Class CR101; Square D Class 2510, 2511, 2512 Type F; Cutler-Hammer Type B330AN; or equal.

C. Integral HP Type
1. Two- or three-pole polyphase.
2. Thermal overload device for each phase.
3. Full voltage, non-reversing, reversing or two-speed as shown or specified.
4. Pushbutton operated with handle guard and lockoff.
5. Neon pilot light(s).
6. Auxiliary contacts as required.
7. Low voltage protection to trip unit on power outage when shown or specified.
8. General Electric Class CR1062; Square D Class 2510, 2511, 2512 Type M; Cutler-Hammer Type B100; or equal.

2.03. MANUAL STARTING SWITCHES

A. General
1. Quick make, quick break toggle action.
2. Contacts - Silver alloy.
3. Enclosures - Adequately sized to contain the starter and all accessories and/or modifications. NEMA classification to meet requirements of Section 26 27 16, Control Panels and Enclosures.

B. Switches
1. Two- or three-pole as shown or required.
2. Toggle operated.
3. Full voltage.
4. Shall be non-reversing, reversing, two-speed as shown or specified.
5. Lock-off provisions and neon pilot light where shown or required.
6. Starting switches labeled for function performed.

7. Square D Class 2510, 2511, 2512, Type K; Cutler-Hammer Type MS; or equal.

2.04. MAGNETIC STARTERS

A. General
   1. Size per NEMA and UL standard to match motor controlled. Exceptions: NEMA Size 1 minimum (except NEMA Size 0 may be used for ventilation equipment 2 HP and less and in a separate H&V control panel) or as shown otherwise.
   2. Starter coil voltage shall be 120 VAC unless noted otherwise.
   3. Provide auxiliary contacts as required.
   4. Provide with melting alloy thermal overloads.

B. Full Voltage Non-Reversing Starting (FVNR)
   1. Across-the-line type, rated 600 volts maximum.
   2. Equipped with double break silver alloy contacts. (Single break shall be supplied on Size 8.)
   3. Straight-through wiring.
   4. Coils - Of molded construction through NEMA Size 7. Coils on Size 8 starters shall be form wound, taped, varnished and baked. Replaceable from the front without removing the starter from the panel.
   5. Suitable for the addition of at least four auxiliary contacts.
   6. Cutler-Hammer Type AN16, Square D Class 8536, General Electric, or equal.

2.05. COMBINATION MAGNETIC STARTERS

A. Factory assembled of UL-listed components within a single enclosure containing MCP, magnetic starter, CPT, overloads, and pilot devices as called for.

B. Handle mechanism permanently connected to switch (operating through approximately a 180-degree arc) and installed in body of enclosure with interlock to prevent unauthorized opening or closing of door with switch on.

C. Provision for padlocking disconnect handle in off position.

D. Disconnect handle having clear indication of switch(es) position.

E. Auxiliary switches where indicated on Contract Drawings.

F. Magnetic starter, auxiliary controls and motor circuit protector as specified.

2.06. MAGNETIC CONTACTORS

A. General
   1. Power and lighting contactors of the voltage, current rating, and number of poles as indicated on the Contract Drawings.
   2. Continuously rated for all types of ballast and tungsten lighting, resistive and motor loads.
   3. Totally enclosed, double break, silver-cadmium-oxide power type.
   4. Auxiliary arcing contacts are not acceptable.
   5. Auxiliary contacts and control circuit fusing as indicated on the Contract Drawings.
   6. Industrial duty rated for 600-volt operation.

B. Electrically-Held Contactor Coils - Continuously rated and encapsulated.

C. Mechanically-Held Contactors - Coil-clearing contacts supplied so that the contactor coil shall be energized only during the instance of operation. Both the latching and unlatching coils shall be encapsulated.

D. Manufacturers
   1. Mechanically Held Over 200 Amps - Square D Class 8903, ASCO Bulletin 911, or equal.
   2. Electrically Held Over 200 Amps - ASCO Bulletin 1035, Square D Class 8903 Type S, or equal.
   3. Mechanically Held 20-200 Amps - ASCO Bulletin 920, Square D Class 8903 Type S, or equal.
   4. Electrically Held 20-200 Amps - Square D Class 8903, ASCO Bulletin 1035, or equal.
   5. Multipole Lighting Contractors, 20 Amp - Square D Class 8903 Type L, ASCO Bulletin 917, or equal.

2.07. RELAYS (0-25 AMPS)

A. See Section 26 09 16, Auxiliary Controls and Relays.

2.08. INTRINSICALLY-SAFE BARRIERS

A. See Section 26 09 16, Auxiliary Controls and Relays.

2.09. REDUCED VOLTAGE STARTERS

A. Factory assembled of UL-listed components within a single enclosure containing MCP or circuit breaker, solid-state reduced voltage motor starter, CPT, overloads, controls, relays and pilot devices as called for.

B. Provide full-voltage bypass starters where shown on the drawings.

C. Handle mechanism permanently connected to switch (operating through approximately a 180-degree arc) and installed in body of enclosure with interlock to prevent unauthorized opening or closing of door with switch on.

D. Provision for padlocking disconnect handle in off position.

E. Disconnect handle having clear indication of switch(es) position.

F. Auxiliary switches where indicated on Contract Drawings.

G. Enclosed controller shall include a six thyristor ((SCR) solid-state power configuration with integrated shorting contactor.

H. Horsepower, voltage and ratings shall be as indicated on the Drawings.

I. Enclosure shall be NEMA ICS type 4X stainless steel.

J. Manufacturer - ABB, PSTX series basis of design.

PART 3 EXECUTION

3.01. GENERAL

A. Install according to the requirements of the NEC and as shown or noted on the Contact Documents.

B. Mount all contactors in an enclosure as individual units or in a control panel as part of a control system.

C. Enclosures and control panels to comply with Section 26 27 16, Control Panels and Enclosures.

3.02. INDIVIDUAL RELAY OR CONTACTOR ENCLOSURES

A. Wall mount unless noted or shown otherwise.

B. Mounting Height - Approximately 60 inches to enclosure top from finished floor.

C. NEMA enclosure for area of mounting, per Section 26 27 16, Control Panels and Enclosures.

3.03. ENCLOSED STARTER MOUNTING

A. Height - Per Section 26 27 16, Control Panels and Enclosures.

B. Methods and Material - Per Section 26 05 29, Electrical Supports, Anchors and Fasteners, and manufacturer’s requirements.

END OF SECTION

SECTION 26 32 13

PACKAGED ENGINE GENERATOR SYSTEMS – 125kW Diesel

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnish and install packaged, 125kW, diesel, outdoor generator in custom, semi-walk-in, sound attenuating enclosure at the Weaver Street Pump Stations.

1.2 CODES AND STANDARDS

B. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards:
   1. CSA 282, 1989 Emergency Electrical Power Supply for Buildings.
   2. IEEE446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
   3. NFPA37
   4. NFPA70 National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
   5. NFPA99 Essential Electrical Systems for Health Care Facilities.
   6. NFPA110 Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.

C. The generator set and supplied accessories shall meet the requirements of the following standards:
   1. NEMA MG1-1998 part 32. Alternator shall comply with the requirements of this standard.
   2. UL142 B Sub-base Tanks.
   3. UL1236 B Battery Chargers.
   4. UL2200. The generator set shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed.

D. The control system for the generator set shall comply with the following requirements.
   1. CSA C22.2, No. 14 B M91 Industrial Control Equipment.
   2. EN50082-2, Electromagnetic Compatibility B Generic Immunity Requirements, Part 2: Industrial.
   3. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical

Equipment.

4. FCC Part 15, Subpart B.
5. IEC8528 part 4. Control Systems for Generator Sets.
6. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
7. UL508. The entire control system of the generator set shall be UL508 listed and labeled.
8. UL1236 BBattery Chargers.

E. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.3 SUBMITTALS

A. Shop Drawings: Indicate electrical characteristics and connection requirements. Show plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical diagrams including schematic and interconnection diagrams.

B. Product Data: Provide data showing dimensions, weights, ratings, interconnection points, and internal wiring diagrams for engine, generator, microprocessor control panel, battery, battery rack, battery charger, exhaust silencer, vibration isolators, fuel tank, trailer and radiator.

C. Prototype Test Reports: Submittals will not be received without submission of prototype test report as specified herein.

D. Manufacturer’s Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

E. Manufacturer’s Certificate: Certify that Products meet or exceed specified requirements.

F. Alternator data indicating sub transient reactance and temperature rise rating to meet requirements specified herein.

1.4 OPERATION AND MAINTENANCE

A. Submit complete Installation, Operation and Maintenance Manuals, including, test reports, maintenance data and schedules, description of operation, and spare parts information. Include instructions for routine maintenance requirements,

service manuals for engine and day tank, oil sampling and analysis for engine wear, and emergency maintenance procedures.

B. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 23, Operations and Maintenance Data.

1.5 QUALITY ASSURANCE

A. To provide proven reliability of the Generator set, three series of tests shall be performed, no exceptions taken:
   1. Prototype model tests
   2. Fully assembled factory production model tests
   3. Field acceptance tests

B. The manufacturer shall provide documentation demonstrating satisfactory prototype and production test results. Generator sets that have not been prototype tested and Factory Production tested as described herein shall not be acceptable.

C. Generator set Prototype Tests: These tests and evaluations must have been performed on a prototype generator set representative of the model specified. A summary of the generator set testing results shall be submittal for review. The manufacturer's standard series of components development tests on the generator system, engine and other major components shall be performed and available for review, but shall not be acceptable as a substitute for a prototype testing on the complete representative generator set prototype.

D. Torsiograph Analysis and Test: The manufacturer of the generator set shall verify that the engine generator set, as configured, is free from harmful torsional stresses. The analysis shall include correlation of empirical data from tests on a representative prototype. The empirical data must include spectrum analysis of the torsional transducer output within the operating speed range of the engine generator set. Calculations based on engine and generator separately are not acceptable.

E. Temperature Rise Test: Complete thermal evaluation of a prototype generator rotor and starter must include actual measurement of internal generator and exciter temperatures by embedded detector method, and measurement of average temperature rise by resistance method. No position measured any place in the windings may exceed the temperature rise limits of NEMA for the particular type of insulation system used. Resistance method temperature rise data shall be confirmed by a full load test on the generator set prototype to include conducted and radiated heat from the engine.

F. Short Circuit Test: A test on a prototype generator set shall have demonstrated that the generator set is designed to withstand the mechanical forces associated with a short circuit condition. With the generator set operating at rated load and speed, the generator terminals must be short circuited on all three phases for a

duration of 20 seconds. At the conclusion of this test, the generator set must be capable of full load operation.

G. Endurance Run Test: A minimum of 500 continuous hours of endurance testing with a representative generator set prototype operating as defined by the manufacturer=s standby rating shall have been performed. Endurance testing shall be used to verify structural soundness and durability.

H. Maximum Power Test: With the prototype generator set at normal operating temperature and with all power consuming auxiliaries in place, the maximum power available at rated speed shall be determined with the governor set at its fuel stop. The generator set shall maintain this power for a minimum of two (2) minutes.

I. Linear Vibration Test: A test for in-line motion of components occurring along a repeatable path shall meet the manufacturer=s acceptable criteria.

J. Cooling System Test: A cooling system test shall demonstrate the ability of the generator set cooling system to maintain normal operating temperature while operating at full rated load and power factor at the highest ambient temperature (122 °F) of the system rating. Cooling air requirements, radiator air flow and maximum allowable restriction at radiator discharge shall be verified by this test.

K. Maximum Motor Starting KVA Test: Motor starting KVA shall be determined by test, based on a sustained RMS recovery voltage of at least 90 percent on no load voltage with the specified load KVA at near zero power factor applied to the generator set.

L. Transient Response, Steady State Speed Control and Voltage Regulation Test: Prototype generator set tests shall demonstrate consistent performance as follows; stable voltage and frequency at all loads from no load to full rated load, consistent frequency kp on load acceptance and rejection and restoration to steady state after sudden load changes. Transient response is a complete generator set (engine, generator, exciter, and regulator) performance criteria and cannot be established on generator data alone.

M. Witness-Generator Set Factory Production Tests: On the equipment to be shipped, a Five (5) hour test shall be performed at rated load and 0.8 PF. These tests shall include certified data to document the following: run at full load, maximum power, voltage regulation, transient and steady state governing, single step load pickup and safety shutdowns. Provide a factory test record of the production testing. The equipment supplier at their expense shall coordinate and provide all transportation and lodging for the owner and Owner’s engineering representatives, minimum of four to witness the above stated factory test. Tests performed at facilities other than the manufacturer’s factory shall not be acceptable.

N. Factory Test: The unit shall completely assembled and all preliminary adjustments made before the test is initiated. 125 KW genset shall be tested with the complete radiator and fan assembly to be shipped. Outside radiator, heat exchanger attachments shall not be acceptable.

O. Testing Procedure:
1. Test diesel-alternator unit at 0.8 PF in the following sequence:
2. 0.5 hour at 1/4 load.
3. 0.5 hours at 1/2 load.
4. 0.5 hours at 3/4 load.
5. 2 hours at full load.

P. Above testing shall be strip chart recorded and certified. During this test, the following measurements shall be taken and recorded on a certified report format:
1. Barometric Pressure.
2. Intake Air Pressure.
3. RPM.
4. Output voltage per phase.
5. Output amperes per phase.
6. Power Factor.
7. KW.
8. Winding temperature.
9. Transient response testing sequence:
10. 0-25%, 25%-0.
11. 0-50%, 50%-0.
12. 0-75%, 75%-0.
13. 0-100%, 100%-0.

Q. Above testing shall be strip chart recorded. Provide necessary equipment and instruments to measure voltage dips and frequency dips. Comparison shall be made to the herein specified alternator performance characteristics prior to acceptance.

R. Field Acceptance Tests: Generator supplier shall provide and conduct a two (2) hour load bank test at unity power factor for the generator set. Contractor must provide portable load bank for testing generator set at 100% load. Load bank test shall test each generator at full nameplate KW ratings. Generator manufacturer's representative shall record test data, as described below. Test data shall be tabulated and typed for submission and approval by the engineer for final acceptance. No handwritten field notes will be allowed.

S. Initial start up and field acceptance tests are to be conducted by the authorized representative of the system manufacturer who supplies the equipment. Contractor responsible for protection of testing equipment and any additional cable, etc., required if equipment cannot be located internally during testing.

T. Test data shall be collected and recorded on the following: Time of day, coolant temperature, operating oil pressure, battery charging rate, cranking time, crank-to-rated frequency time, voltage and frequency overshoot, load assumption-to-steady state voltage and frequency stabilization time, operating voltage, frequency, current, kilowatts and power factor. All data shall be taken every fifteen (15) minutes.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten (10) years documented experience, and with an authorized distributor offering 24 hour parts and service availability within 50 miles of the project. Proposed engine/generator combination shall have been in production a minimum of five (5) years.

B. Supplier: Authorized distributor of specified manufacturer with minimum five (5) years documented experience with specified products and factory-trained service technicians.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70, NFPA 110, and NFPA 101.

B. Furnish Products listed and classified by Underwriters Laboratories as suitable for purpose specified and indicated.

1.8 PRE-INSTALLATION CONFERENCE

A. Convene one (1) week prior to commencing work of this Section.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.

B. Accept unit on site mounted on trailer. Inspect for damage. Provide written verification that Genset tested and Genset received are one and the same.

C. Protect equipment from dirt and moisture by securely wrapping in heavy plastic during construction.

1.9 EXTRA MATERIALS

A. Provide two (2) of each fuel, oil and air filter element, engine belts and hoses.

1.10 WARRANTY

A. A no deductible comprehensive warranty shall be provided for all products against defects in materials and workmanship for a five-year or 1500 hour period from the start-up date. Warranty shall cover all costs of covered repairs, including travel expenses.

1.11 SERVICE AGREEMENT

A. Manufacturer shall provide Owner with a One (1) year service agreement that includes changing all fluids and filters once a year and a minor inspection six (6) months after each change.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Approved manufacturer:
   1. Cummins Power Generation, model C125D6C rated for STANDBY POWER with UC3F Frame Alternator as distributed by Cummins Sales & Service. 890 Zerega Avenue, Bronx, NY 10473. Contact Ed Cheung: 718-892-2400, ext. 217.

B. It is intended that all products specified herein be of standard ratings, therefore, the KW and KVA, starting KVA and maximum allowable voltage dip, ratings, etc., shall be the manufacturer's next size or rating to exactly meet the specifications. No exceptions.

2.2 DIESEL ENGINE-GENERATOR SET

A. Ratings
   1. The generator set shall operate at 1800 rpm and at a voltage of: 208 Volts AC, 3-phase, 4-wire, 60 hertz.
   2. The generator set shall be rated at 125 kW, 156.25 kVA at 0.8 PF, standby rating, based on site conditions of: Altitude 1,000 ft., ambient temperatures up to 122 degrees F (50 degrees C).

B. Performance
   1. Voltage regulation shall be plus or minus 0.5 percent for any constant load between no load and rated load. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.
   2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%.

3. The diesel engine-generator set shall accept a single step load of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.
4. Motor starting capability shall be a minimum of 607 kVA. The generator set shall be capable of recovering to a minimum of 90% of rated no load voltage following the application of the specified kVA load at near zero power factor applied to the generator set.
5. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic, and no 3rd order harmonics or their multiples. Telephone influence factor shall be less than 40.
6. The generator set shall be certified by the engine manufacturer to be suitable for use at the installed location and rating, and shall meet all applicable exhaust emission requirements at the time of commissioning.

C. Construction
1. The engine-generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.
2. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight. All active control components shall be installed within a UL/NEMA 3R enclosure. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.

D. Connections
1. The generator set load connections shall be composed of silver- or tin-plated copper bus bars, drilled to accept mechanical or compression terminations of the number and type as shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.
2. Power connections to auxiliary devices shall be made at the devices, with required protection located at a wall-mounted common distribution panel if walk-in enclosure.
3. Generator set control interfaces to other system components shall be made on a permanently labeled terminal block assembly. Labels describing connection point functions shall be provided.

2.3 ENGINE AND ENGINE EQUIPMENT

A. The engine shall be diesel, minimum EPA TIER 3, 4 cycle, radiator and fan cooled. Minimum displacement shall be 272 cubic inches. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Two cycle engines are not acceptable.

B. A digital electronic governor system shall provide automatic isochronous

frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed. The governing system shall include a programmable warm up at idle and cooldown at idle function. While operating in idle state, the control system shall disable the alternator excitation system.

C. Skid-mounted radiator and cooling system rated for full load operation in 122 degrees F (50 degrees C) ambient as measured at the alternator air inlet. Radiator fan shall be suitable for use in a system with 0.5 in H_2O restriction. Radiator shall be sized based on a core temperature that is 20F higher than the rated operation temperature, or prototype tested to verify cooling performance of the engine/radiator/fan operation in a controlled environment. Radiator shall be provided with a duct adapter flange. The equipment manufacturer shall fill the cooling system with a 50/50-ethylene glycol/water mixture prior to shipping. Rotating parts shall be guarded against accidental Electric starter(s) capable of three complete cranking cycles without overheating.

2.4 ENGINE ACCESSORY EQUIPMENT

A. The engine for the generator shall include the following accessories:
   1. Positive displacement, contact.
   2. Mechanical, full pressure, lubrication oil pump.
   3. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.
   4. An engine driven, mechanical, positive displacement fuel pump. Fuel filter with replaceable spin-on canister element. Fuel cooler, suitable for operation of the generator set at full rated load in the ambient temperature specified shall be provided if required for operation due to the design of the engine and the installation.
   5. Replaceable dry element air cleaner with restriction indicator.
   6. Flexible supply and return fuel lines.
   7. Engine mounted battery charging alternator, 40-ampere minimum, and solid-state voltage regulator.

B. Coolant heater
   1. Engine mounted, thermostatically controlled, coolant heater(s) for each engine. Heater voltage shall be as shown on the project drawings. The coolant heater shall be UL499 listed and labeled.
   2. The coolant heater shall be installed on the engine with silicone hose connections. Steel tubing shall be used for connections into the engine coolant system wherever the length of pipe run exceeds 12 inches. The coolant heater installation shall be specifically designed to provide proper

venting of the system. The coolant heaters shall provisions to isolate the heater for replacement of the heater element without draining the coolant from the generator set. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.

3. The coolant heater shall be provided with a 24VDC thermostat, installed at the engine thermostat housing. An AC power connection box shall be provided for a single AC power connection to the coolant heater system.
4. The coolant heater(s) shall be 208/240V, 2000 watts and sized as recommended by the engine manufacturer to warm the engine to a minimum of 104F (40C) in a 40F (4C) ambient, in compliance with NFPA110 requirements, or the temperature required for starting and load pickup requirements of this specification.

C. Provide vibration isolators, internal pad type, quantity as recommended by the generator set manufacturer.

D. Starting and Control Batteries shall be calcium/lead antimony type, 12 volt DC, sized as recommended by the engine manufacturer, complete with battery cables and connectors. The batteries shall be capable of a minimum of three complete 15-second cranking cycles at 40F ambient temperature when fully charged.

E. Provide exhaust silencer(s) for each engine of size and type as recommended by the generator set manufacturer and approved by the engine manufacturer. The mufflers shall be critical grade installed inside enclosure.

F. A UL listed/CSA certified 6 amp voltage regulated battery charger shall be provided for each engine-generator set. The charger shall be located inside the automatic transfer switch. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings.

G. Provide Alternator Anti-Condensation heater – 120 VAC, 100W.

H. Provide Engine Oil heater – 120 VAC, 150W.

2.5 AC ALTERNATOR

A. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system and shall be UL1446 listed. Actual temperature rise measured by resistance method at full load shall not exceed 80 degrees Centigrade.

B. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.

C. The subtransient reactance of the alternator shall not exceed 13 percent, based on the 105°C rise rating.

D. Alternator shall be rated for a minimum of 130 KW at 105°C, 120/208 VAC standby.

2.6 ENGINE GENERATOR SET CONTROL

A. Generator set Control. The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.

B. The control shall be mounted on the generator set, or may be mounted in a free-standing panel next to the generator set if adequate space and accessibility is available. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.

C. Control Switches

1. Mode Select Switch. The mode select switch shall initiate the following control modes. When in the RUN or MANUAL position the generator set shall start, and accelerate to rated speed and voltage as directed by the operator. A separate push-button to initiate starting is acceptable. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
2. EMERGENCY STOP switch. Switch shall be Red "mushroom-head" push-button. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.
3. RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
4. PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.

D. Generator Set AC Output Metering. The generator set shall be provided with a

metering set including the following features and functions:

1. Digital metering set, .5% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours, and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three-phase voltages (line to neutral or line to line) simultaneously.
2. Analog voltmeter, ammeter, frequency meter, power factor meter, and kilowatt (KW) meter. Voltmeter and ammeter shall display all three phases. Meter scales shall be color coded in the following fashion: green shall indicate normal operating condition, amber shall indicate operation in ranges that indicate potential failure, and red shall indicate failure impending. Metering accuracy shall be within 1% at rated output. Both analog and digital metering are required.
3. The control system shall monitor the total load on the generator set, and maintain data logs of total operating hours at specific load levels ranging from 0 to 110% of rated load, in 10% increments. The control shall display hours of operation at less than 30% load and total hours of operation at more than 90% of rated load.
4. The control system shall log total number of operating hours, total kWH, and total control on hours, as well as total values since reset.

E. Generator Set Alarm and Status Display.

1. The generator set control shall include LED alarm and status indication lamps. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. Functions indicated by the lamps shall include:
    a. The control shall include five configurable alarm-indicating lamps. The lamps shall be field adjustable for any status, warning, or shutdown function monitored by the genset. They shall also be configurable for color, and control action (status, warning, or shutdown).
    b. The control shall include green lamps to indicate that the generator set is running at rated frequency and voltage, and that a remote start signal has been received at the generator set. The running signal shall be based on actual sensed voltage and frequency on the output terminals of the generator set.
    c. The control shall include a flashing red lamp to indicate that the control is not in automatic state, and red common shutdown lamp.
    d. The control shall include an amber common warning indication lamp.
2. The generator set control shall indicate the existence of the warning and shutdown conditions on the control panel. All conditions indicated below for warning shall be field-configurable for shutdown. Conditions required to be annunciated shall include:

        low oil pressure (warning)
        low oil pressure (shutdown)

oil pressure sender failure (warning)
low coolant temperature (warning)
high coolant temperature (warning)
high coolant temperature (shutdown)
high oil temperature (warning)
engine temperature sender failure (warning)
low coolant level (warning)
fail to crank (shutdown)
fail to start/overcrank (shutdown)
overspeed (shutdown)
low DC voltage (warning)
high DC voltage (warning)
weak battery (warning)
low fuel-daytank (warning)
high AC voltage (shutdown)
low AC voltage (shutdown)
under frequency (shutdown)
over current (warning)
over current (shutdown)
short circuit (shutdown)
ground fault (warning) (optional--when required by code or specified)
over load (warning)
emergency stop (shutdown)
(4) configurable conditions

3. Provisions shall be made for indication of four customer-specified alarm or shutdown conditions. Labeling of the customer-specified alarm or shutdown conditions shall be of the same type and quality as the above-specified conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.

F. Engine Status Monitoring.

1. The following information shall be available from a digital status panel on the generator set control
engine oil pressure (psi or kPA)
engine coolant temperature (degrees F or C)
engine oil temperature (degrees F or C)
engine speed (rpm)
number of hours of operation (hours)
number of start attempts
battery voltage (DC volts)
2. The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a

percent of the standby rating of the generator set.

3. Provide and install a 20-light LED type remote alarm annunciator with horn, located as shown on the Drawings or in a location that can be conveniently monitored by facility personnel. The remote annunciator shall provide all the audible and visual alarms called for by NFPA Standard 110 for level 1 systems for the local generator control panel. Spare lamps shall be provided to allow future addition of other alarm and status functions to the annunciator. Provisions for labeling of the annunciator in a fashion consistent with the specified functions shall be provided. Alarm silence and lamp test switch(es) shall be provided. LED lamps shall be replaceable, and indicating lamp color shall be capable of changes needed for specific application requirements. Alarm horn (when switched on) shall sound for first fault, and all subsequent faults, regardless of whether first fault has been cleared, in compliance with NFPA110 3-5.6.2. The interconnecting wiring between the annunciator and other system components shall be monitored and failure of the interconnection between components shall be displayed on the annunciator panel.

   The annunciator shall include the following alarm labels, audible annunciation features, and lamp colors:

Condition	Lamp Color	Audible Alarm
Genset Supplying Load	Amber	No
Charger AC Failure	Amber	Yes
Low Coolant Level	Amber	Yes
Low Fuel Level	Red	Yes
Check Genset	Amber	No
Not In Auto	Red	Yes
Genset Running	Amber	No
High Battery Voltage	Amber	Yes
Low Battery Voltage	Red	Yes
Weak Battery	Red	Yes
Fail to Start	Red	Yes
Low Coolant Temperature	Red	Yes
Pre-High Engine Temperature	Amber	Yes
High Engine Temperature	Red	Yes
Pre-Low Oil Pressure	Red	Yes
Low Oil Pressure	Red	Yes
Overspeed	Red	Yes
(4) Spares	Configurable	Configurable

2.7 ENGINE CONTROL FUNCTIONS

A. The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15-second rest period between cranking periods.

B. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled. Total duration of operating time in the idle mode shall be controlled by the system, to prevent degradation of the engine capabilities due to excess operating time at idle.

C. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting.

D. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.

E. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure conditions.

2.8 ALTERNATOR CONTROL FUNCTIONS

A. The generator set shall include a full wave rectified automatic digital voltage regulation system that is matched and prototype tested by the engine manufacturer with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase line to neutral RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below an adjustable frequency threshold. Torque matching characteristic shall be adjustable for roll-off frequency and rate, and be capable of being curve-matched to the engine torque curve with adjustments in the field. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alphanumeric LED readout to indicate setting level. Rotary potentiometers for system adjustments are not acceptable.

B. Controls shall be provided to monitor the output current of the generator set and initiate an alarm (over current warning) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (over current shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.

C. Controls shall be provided to individually monitor all three phases of the output current for short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (short circuit shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445.

D. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition (over load) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.

E. An AC over/under voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.

2.9 OTHER CONTROL FUNCTIONS

A. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 25VDC or more than 32 VDC. During engine cranking (starter engaged), the low voltage limit shall be disabled, and DC voltage shall be monitored as load is applied to the battery, to detect impending battery failure or deteriorated battery condition.

2.10 GENERATOR MAIN LINE CIRCUIT BREAKERS & ADDITIONAL PROTECTION

A. The generator set shall be provided with genset mounted, quantity two (2) 400 amp main line circuit breakers. The circuit breaker shall incorporate an electronic trip unit that operates to protect the alternator under all overcurrent conditions, or a thermal-magnetic trip with other overcurrent protection devices that positively protect the alternator under overcurrent conditions. Electronic trip unit shall include adjustable long-time, short-time and instantaneous trip settings. The supplier shall submit time overcurrent characteristic curves and thermal damage

curve for the alternator, demonstrating the effectiveness of the protection provided.

B. The generator set shall be provided with a utility grade protective relay, designed to provide thermal overload protection for the alternator, and performance certified for that purpose by a 3rd party testing organization. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided. Relay shall be installed to allow shutdown of the generator excitation system on an alternator overload condition, with the engine operating for a cool-down period before shutdown. The relay shall not include an instantaneous trip function

2.11 WALK IN SOUND ENCLOSURE & 500 GALLON UL SUB-BASE TANK

A. Semi walk-in sound enclosure & 500 gallon sub-base tank shall be as manufactured by Acoustical Sheetmetal, Inc., 2600 Production Road, Virginia Beach, VA 23454.

B. Structure: Frame of enclosure to be fabricated of structural steel tubing. All steel material to conform to A.S.T.M. A-36. All connections to be full welds by technicians certified under A.S.M.E. Section IX. All steel to be free from rust and defects. Entire frame to be primed and painted with two coats of epoxy paint. All members to be straight, true and at right angles to connecting parts. Overall dimensional tolerance to be plus or minus 1/8".

C. Aluminum Skin: Enclosure to be covered with 14 gauge (0.063") pre-painted aluminum, color white, bronze, or mill finish marine grade aluminum. Aluminum to be separated from steel with 1/8" closed cell rubber foam insulation. All fasteners to be made of non-corrosive materials. All panel fasteners will not be visible on the exterior. Solid aluminum rub rails will surround the top and bottom perimeters, caulked with silicone sealant and secured with stainless steel self-tapping screws. Roof panel joints to have continuous covers, sealed and secured to steel frame with corrosion resistant fasteners. Color to be selected from manufacturer's standard options by Owner.

D. Insulation: Three inch (3") thick panels double wall construction filled 100% with sound absorbing Fiberglass insulation with a flame spread of 10, fuel contributed of 0 and a smoke developed 0, to be placed at walls and ceiling covered with 18 gauge (.040) mill-finished perforated aluminum. Air intake and discharge chambers to be insulated to restrict the transmission of generator set noise. Entire assembly shall be able to reduce generator set noise in free field to 65 dB/A at a distance of 7 meters from enclosure in any direction.

D. Access: All doors to be made of the same material as the enclosure skin, two solid double doors, 30"wide x 48"high on side of enclosure. Hinges to be butt hinges of solid stainless steel. Door handles to be three-point latch type, with panic release from inside of enclosure keyed alike. Lock materials to be made of non-corrosive materials. Stainless steel door holders will be installed on swinging

doors. Rain gutters to be placed over all doors. Lift out type doors to be used in areas of reduced access.

E. Air Intake: External sound absorbing rear mounted hood with internal sound absorbing baffle system with galvanized motor operated dampers. Size of louver to be sufficient to meet combustion and cooling air movement requirements. Air intake louvers to have bird screen mesh to prevent ingestion of debris. Air velocity shall not exceed 1000 feet per minute. An internal motor operated damper shall be installed and wired to the generator set.

F. Air Discharge**:** External sound absorbing vertical plenum with internal sound absorbing baffle system, birdscreen, and gravity louvers.

G. Accessories: Muffler brackets to be solid aluminum structural angle, welded as one piece for internal installation from a super critical sound absorber muffler. Muffler straps provided to be custom fit for the muffler. Insulation for interior muffler/flex and exhaust pipe provided and installed. Aluminum rain caps and collars made to prevent rain intrusion at roof penetration. Engine oil and water drains to be extended to exterior of enclosure**.**

H. Electrical Accessories:
1 Power Panelboard to be 100 Amp, three phase, 120/208 VAC
2 LDE type lights.
2 Light switches.
2 Duplex receptacles.
2 Junction boxes for battery charger and jacket water heater connection.
2 Connection for motor operated damper to junction box or generator control panel.
3 Connection for low alarm, high alarm, leak alarm.
1 Exhaust fan with thermostat and gravity louver.
1 Space heater with thermostat, 5 KW.
2 External emergency break glass station
1 18” Exhaust fan with thermostat
2 Exterior LED lights
1 Photocell
2 Emergency Break glass stations
2 Emergency Dual head lights
1 Automatic Transfer Switch
1 Manual Transfer Switch
1 Portable generator connection cabinet, exterior mounted

All electrical accessories shall be pre-installed by the enclosure manufacturer and pre-wired in rigid steel conduit.

I. Steel Base to be fabricated of structural steel channel with 3/16: thick diamond plate floor conforming to the requirements of A.S.T.M. A-36. All steel to be new and free from rust and scaling. All steel members to be primed and painted with no less than two coats of epoxy paint. Steel cross members to be of structural steel channel. Strategically placed to support the generator set. Steel angle will be placed under the seams of the floor material to provide continuous support.

J. Plates to be welded in such a manner as to prevent buckling. All welds to be performed by technicians certified under A.S.M.E. Section IX. Top and bottom of floor to be primed and painted with no less than two coats of epoxy paint. Floor cutouts (electrical stub-up area) shall be provided as necessary to provide access to the electrical connections area of the generator set. Fuel storage compartments under floor shall be designed and fabricated in compliance with Underwriter's Laboratories Standard UL 142 Specifications. The rupture tank shall meet the same specifications for integrity and strength.

K. Provide a sub-base nominal 500 gallon fuel tank for the generator set. The sub-base fuel tank shall be UL142 listed and labeled. Installation shall be in compliance to NFPA 37. The fuel tank shall be a double-walled, steel construction and include the following features:

1. Emergency tank and basin vents.
2. Mechanical level gauge.
3. Fuel supply and return lines, connected to generator set with flexible fuel lines as recommended by the engine manufacturer and in compliance to NFPA 37 requirements.
4. Leak detection provisions, wired to the generator set control for local and remote alarm indication.
5. Low level float switches to indicate fuel level. Wire switches to generator control for local and remote indication of fuel level.
6. Basin drain.
7. Integral lifting provisions.

L. COUPLING/VENTS AND ALARM SWITCHES FOR FUEL BASE STORAGE TANK

A: 3/4" Fuel pickup and return piping
B: 2" Vent to outside from enclosure
C: 1 ½" Mechanical fuel level gauge
D: 2" Lockable fuel fill cap with 7 Gallon spill container
E: 1" Drain coupling with plug
F: 1 1/4" High/low fuel level alarm switch
G: 8” Emergency vent with 2” Spare Couplings with plugs

M. COUPLING/VENTS AND ALARM SWITCHES FOR RUPTURE TANK

A: 1" Drain coupling with plug
B: 1 1/4" Leak alarm switch
C: 8” Emergency vent

N. Supports and "D" type lifting rings shall be provided at such location as to provide for balanced lifting at the enclosure, generator set and base assembly.

O. Two inch (2") high environmental protection barrier placed around electrical stub-up area and enclosure interior wall to help prevent liquid spill-over to the environment.

P. Provide galvanized steel access platforms with stairs and railings. Height as required and as shown on the drawings.

PART 3 EXECUTION

3.1 ACCEPTANCE

A. Equipment shall be initially started and operated by representatives of the manufacturer.

B. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to final testing of the system.

C. Contractor shall provide all fuel for testing and fill fuel tank complete prior to turnover to Owner.

3.2 TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than two (2) four (4) hours sessions in duration and the class size shall be limited to five (5) persons. Training date shall be coordinated with the facility owner.

3.3 DEMONSTRATION

A. Provide systems demonstration. Electric Contractor shall provide fuel for testing and shall fill tank complete after all testing is done and before turning over to Owner.

B. Describe loads connected to standby system and restrictions for future load additions.

C.

D. Simulate power outage by interrupting normal source and demonstrate that system operates to provide standby power.

+ + END OF SECTION + +

SECTION 26 36 13

ENCLOSED TRANSFER SWITCHES

PART 1 GENERAL

1.1 SUMMARY

A. Provide delayed transition automatic transfer switches, manual/non-automatic transfer switches and portable generator cam-lock boxes as shown on the drawings.

1.2 RELATED SECTIONS

A. Section 26 05 00 - ELECTRICAL WORK

B. Section 26 32 13 – Packaged Engine Generator Systems – 125 kW Diesel

1.3 REFERENCES

A. NFPA 70 - National Electrical Code.

B. NEMA ICS 1 - General Standards for Industrial Control and Systems.

C. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.

D. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

E. UL 891 - According to this UL Standard, the equipment shall be labeled: “Suitable for use only as service equipment.”

F. UL 1008 - Standard for Transfer Switch Equipment

1.4 QUALIFICATIONS

A. Manufacturer - Company specializing in manufacturing the products specified in this section with minimum 20 years’ documented experience and with service facilities within 50 miles of the project.

B. Supplier - Authorized distributor of specified manufacturer with minimum 10 years’ documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to internal components, enclosure and finish.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.7 MAINTENANCE SERVICE

A. Furnish service and maintenance of transfer switch for one year from date of Substantial Completion.

1.8 MAINTENANCE MATERIALS

A. Provide two of each special tool required for maintenance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. ASCO, Model 7000 Series 7NTS (design basis, non-automatic transfer switches).

B. ASCO, Model 7000 Series 7ADTS (design basis, delayed-transition, automatic transfer switches).

2.2 AUTOMATIC TRANSFER SWITCH

A. Description - NEMA ICS 10, automatic transfer switch (ATS).

B. The electrical operator shall be a single-solenoid mechanism, momentarily energized. Main operators which include overcurrent disconnect devices will not be accepted.

C. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.

D. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.

E. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand current capability and be protected by separate arcing contacts.

F. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.

G. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

H. Where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor terminal plate with fully-rated AL-CU pressure connectors shall be provided.

2.3 SERVICE CONDITIONS

A. Service Conditions - NEMA ICS.

B. Temperature - 105 degrees F.

C. Altitude - 100 feet.

2.4 RATINGS

A. Voltage - 120/208 volts, 3 phase, 4 wire, 60 Hertz.

B. Switched Poles - Three.

C. Load Inrush Rating - Combination load.

D. Continuous Rating – 400 amperes, or as shown on the drawings.

E. Interrupting Capacity - 100 percent of continuous rating.

F. Withstand Current Rating - The ATS/MTS shall be rated to close on and withstand the available rms symmetrical short circuit current at the ATS/MTS terminals with the type of overcurrent protection shown on the plans.

2.5 PRODUCT OPTIONS AND FEATURES

A. Indicating Light Emitting Diode Lights - Mount in cover of enclosure, one to indicate when the ATS/MTS is connected to normal source (green), one to indicate when the ATS/MTS is connected to emergency source (red), one to

indicate when the normal source is available (green), and one to indicate when the emergency source is available (red).

B. Emergency Switch - Mount in cover of enclosure to initiate manual transfer to emergency source.

C. Normal Switch - Mount in cover of enclosure to initiate manual transfer to normal source.

D. Transfer Switch Auxiliary Contacts - Contacts rated 10 amps, 480VAC shall be provided consisting of one contact, closed when the ATS is connected to normal source and one contact closed, when the ATS is connected to emergency source.

E. Normal Source Monitor - The voltage of each phase of the normal source shall be monitored, with pickup adjustable from 85 to 100 percent and dropout adjustable from 75 to 98 percent of pickup setting.

F. Alternate Source Monitor - Single-phase voltage sensing of the emergency source shall be provided, with a pickup voltage adjustable from 85 to 100 percent and frequency sensing with pickup adjustable from 90 to 100 percent.

G. In-phase monitor.

H. Solid neutral.

I. Provide 3-phase voltage monitor for the normal and emergency sources (accessories 18B/G) with pair of normally-open and normally closed dry-contacts for alarm monitoring.

J. Automatic transfer switches shall include a keyed selector switch to select starting the permanent stationary generator or a portable generator. Accessory 6GK.

2.6 ENCLOSURE

A. Enclosure - ICS 6, NEMA Type 12.

2.7 PORTABLE GENERATOR CAM-LOCK BOX

A. Portable generator cam-lock box shall be as manufactured by ESL Power Systems, TempTap – Generator Docking Station with breakers series 4600.

B. Enclosure – NEMA Type 3RX, stainless steel, powder-coated ANSI Grey.

C. Circuit Breaker – sizes as shown on the drawings, 3-pole, thermal magnetic type disconnect.

D. Color-coded cam style male inlets, 400A rated, arranged for 120/208V, 3Ø, 4-wire service.

E. UL 1008 listed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surface is suitable for transfer switch installation.

3.2 INSTALLATION

A. Install transfer switches in accordance with manufacturer's instructions.

B. Provide engraved plastic nameplates under the provisions of Section 26 05 00, Electrical Work.

3.3 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems.

3.4 DEMONSTRATION

A. Demonstrate operation of transfer switch in normal and emergency modes.

3.5 TESTS AND CERTIFICATION

A. The manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.

B. The manufacturer shall be certified to the ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001.

3.6 SERVICE REPRESENTATION

A. The ATS/MTS manufacturer shall maintain a local service center within a 50-mile radius of the job location. The service center's personnel must be factory trained and must be on call 24 hours per day, 365 days per year.

The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.

+ + END OF SECTION + +

SECTION 26 40 00

OVERCURRENT PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Circuit breakers below 600 volts.

B. Fuses below 600 volts.

C. Spare fuse cabinet.

1.2 RELATED SECTIONS

A. General Clauses

B. Section 26 05 00 – ELECTRICAL WORK

C. Section 26 27 16 - CONTROL PANELS AND ENCLOSURES

D. Section 26 05 29 - ELECTRICAL SUPPORTS, ANCHORS AND FASTENERS

1.3 REFERENCES

NECA (National Electrical Contractors Association) “Standard of Installation”	
NEMA AB 1	Molded Case Circuit Breakers
NFPA 70	National Electrical Code
NEMA FU 1	Low Voltage Cartridge Fuses

1.4 SUBMITTALS

A. Submit under provisions of Section 26 05 00, Electrical Work

B. Product Data - Provide catalog sheets showing ratings, trip units, time current curves, dimensions, and enclosure details.

C. Manufacturer’s Installation Instructions - Indicate application conditions and limitations of use stipulated by product testing agency specified under Article 1.05. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

D. Samples as requested by the Engineer.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Circuit Breakers - Conform to requirements of NEMA AB-1 and UL 489.

C. Furnish products listed and classified by UL or other third-party testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

1.6 EXTRA MATERIALS

A. Provide three of each size and type current limiter.

B. Contractor to provide separate NEMA 12 enclosure and shall provide spare fuses for each type used, as follows:
   1. Power distribution fuses above 200 amps - One set.
   2. All others - Two sets.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Circuit Breakers
   1. Square D
   2. Cutler Hammer
   3. General Electric
   4. Or approved equal.

B. Main Fuses, Unless Otherwise Noted
   1. Bussman - Model CPN-RK
   2. Gould-Shawmut - Model A2K

C. Motor and Device Fuses, Unless Otherwise Noted
   1. Bussman - Model RU5
   2. Gould-Shawmut - Model TRI-ONIC

2.2 GENERAL REQUIREMENTS

A. Circuit breakers shall be of the molded case type.

B. Shall consist of the number of poles, ampere rating, and interrupting rating as shown or specified.

C. Molded case circuit breakers shall have overcenter toggle-type mechanism, providing quick-make, quick-break action. Mechanism shall be mechanically

trip-free from the handle so the contacts cannot be held closed against short circuit currents.

D. Multiple pole breakers shall be common trip type.

E. On and Off positions shall be clearly marked and color coded.

F. All breakers in panels for switching duty shall be “SWD” or “T” rated, for switching duty.

G. Breakers 250 ampere frame and larger shall have interchangeable trip.

H. All main service breakers shall have 100 percent ampere rating and shall be service entrance rated.

I. Breakers over 100-ampere frame size shall have front adjustable magnetic trip elements to provide instantaneous tripping over a range of 400 to 1000 percent of the continuous ampere trip rating.

J. All breakers shall be of the bolt-on type.

K. Dimensions and Performance - NEMA FU 1, Class as specified or indicated.

L. Voltage - Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.

2.3 CONTACTS

A. Contacts shall be non-welding under rated operating conditions.

B. Silver-to-silver type.

C. Provide with suitable arc interrupting devices.

2.4 TERMINATIONS

A. Circuit breakers shall have lugs that accommodate wire sizes shown on the Contract Drawings, including additional lugs where shown or required.

B. Lugs shall be UL listed for copper conductors only.

C. Breakers shall be UL listed for mechanical-type lugs.

2.5 GROUND FAULT PROTECTION

A. 250-ampere frame circuit breakers or less.
   1. Integral with circuit breaker.
   2. Push to test.

3. Reset feature.
4. Trip indication.
5. 0.8-second maximum pickup time.

2.6 RATINGS

A. All circuit breakers shall meet or exceed the following unless otherwise noted on the Contract Drawings or in the specifications.

FRAME SIZE MAXIMUM CONSTANT CURRENT - AMPS	NEMA* INTERRUPTING CAP. SYMMETRICAL-AMPS	POLES	MAXIMUM VOLTAGE RATING
100	10,000 @ 120 volts	1	120
100	10,000 @ 240 volts	2,3	240
100	18,000 @ 480/277 volts	1	480
100	18,000	2,3	600
250 Branch	25,000	2,3	600
250 Main	35,000	2,3	600
400 Branch	30,000	2,3	600
400 Main	35,000	2,3	600
1000 Branch	30,000	2,3	600
1000 Main	65,000	2,3	600
1200	100,000	2,3	600
2000	100,000	2,3	600

*Interrupt ratings are at 480 volts unless noted otherwise.

2.7 BREAKER TRIP CHARACTERISTICS

A. All breakers shall be Type A thermal magnetic type unless noted otherwise on the Contract Drawings or specified.

B. Thermal Magnetic Type (Type A)
1. Long time, nonadjustable, thermal overload, trip.
2. Instantaneous, electromagnetic trip.
3. Ambient compensating.
4. “Push-to-trip” test button.

C. Integral Magnetic and Solid State Trip Type (Type B)
1. Provide solid-state logic programmer.
2. Long delay, range adjustable trip.
3. Magnetic pick up, range and time adjustable, trip.
4. Integral power supply.
5. 100 percent equipment rated.

6. Integral ground fault protection where noted on the Contract Drawings or specified.
7. Ground fault system neutral current transformer for each breaker equipped for ground fault.
8. “Push-to-trip” pushbutton.
9. Adjustable rating plug type.

D. Integral Solid State Trip Type (Type C)
1. Solid state logic programmer.
2. Long delay, range and time adjustable, trip.
3. Short delay, range and time adjustable, trip where noted.
4. Instantaneous, range adjustable, trip unless noted otherwise for specific breakers.
5. Ground fault, range and time adjustable, trip where noted.
6. Neutral sensor for each breaker equipped with ground fault on three phase, four wire, enclosed breakers, panels and switchboards.
7. 100 percent equipment rated.
8. Integral power supply.
9. “Push to Trip” button.
10. Sensor ratings 200-1200 ampere.
11. Provide trip targets for overload, short circuit and ground fault for breakers as noted on Contract Documents:

E. Motor Circuit Protectors (Type MCP)
1. Each pole shall provide instantaneous short circuit protection.
2. MCP shall have provisions for adjusting the instantaneous magnetic trip element.
3. All poles shall be constructed to open, close, and trip simultaneously.
4. The MCP mechanism shall be the transient inrush suppressor type appropriate for the protection of energy efficient motors.

2.8 CURRENT LIMITERS

A. Current Limiter - Designed for application with molded case circuit breaker.

B. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.

C. Provide interlocks to trip circuit breaker and to prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.

2.9 FUSES

A. Main Service Switches - Class RK (time delay).

B. Motor Load Feeder Switches - Class RK (time delay).

C. Other Feeder Switches - Class RK (time delay).

D. Power Branch Circuits - Class RK (time delay).

E. Motor Branch Circuits - Class RK (time delay).

F. Lighting Branch Circuits - Glass G.

PART 3 EXECUTION

3.1 GENERAL

A. Circuit breaker trip ratings and fuse sizings shown on the Contract Drawings are maximum for the specific application.

B. Breakers shall be removable from the front of the panel or board without disturbing adjacent units.

C. All breakers and fuses shall be suitably mounted in an enclosure in accordance with Section 26 27 16, Control Panels and Enclosures, and supported in accordance with Section 26 05 29, Electrical Supports, Anchors and Fasteners.

D. Individual-mounted circuit breakers and fused switches shall be provided with NEMA enclosures and installed at locations shown on Drawings and as required by National Electrical Code (NEC) at approximately 60 inches from floor to top of enclosure.

E. Fuses shall be of the rejection type unless otherwise shown or specified.

F. Install spare fuse enclosure where indicated by Owner.

3.2 HANDLE OPERATORS

A. All enclosures for individually-mounted circuit breakers or fuses shall have enclosure-mounted handle operators, operating through approximately 180-degree arc. Flush mounted circular rotating handle operators are unacceptable.

3.3 DISCONNECTING MEANS - LOCKING

A. For separately-mounted exterior circuit breakers, safety and disconnect switches, provide locking-type handles to be locked in both the On (closed) or Off (open) positions.

3.4 IDENTIFICATION

A. Circuit breakers shall be provided with uniformly designed nameplates to clearly indicate the type, rating, listing/recognition/certification marks, and

other information as defined in UL 489 in accordance with Section 26 05 00, Electrical Work.

3.5 TERMINALS

A. All terminals shall comply with UL 486A and B and CSA 1165 Standards. Torque markings shall be provided and followed per UL 489.

B. Terminals shall be amply sized, including adapters or special lugs to connect the conductor(s) as shown, specified or required.

3.6 RATINGS - FUSES

A. Main distribution fuses shall be sized as shown on the Contract Drawings.

B. Motor and device fuses shall be sized as per the manufacturer's requirements in accordance with the NEC.

3.7 FIELD QUALITY CONTROL

A. Inspect each circuit breaker visually, per NETA ATS-1995.

B. Perform several mechanical On-Off operations on each circuit breaker.

C. Verify circuit continuity on each pole in closed position.

D. Determine that circuit breaker will trip on overcurrent condition, with tripping time to NEMA AB-1 requirements.

E. Include description of testing and results in test report.

3.8 ADJUSTING

A. Adjust trip settings so that circuit breakers coordinate with other overcurrent protective devices in circuit.

B. Adjust trip settings to provide adequate protection from overcurrent and fault currents.

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SECTION 31 20 00

EARTH MOVING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment, and incidentals required to perform all excavating, filling, and grading, and disposing of earth materials as shown, specified, and required for construction of structures, Underground Facilities, and other facilities required to complete the Work.
   2. Preparation of subgrade for slabs and pavements is included under this Section.
   3. No classification of excavated materials will be made. Excavation includes all materials regardless of type, character, composition, moisture, or condition thereof.

B. Related Sections:
   1. Section 03 00 05, Concrete.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI/AISC 360, Specification for Structural Steel for Buildings.
   2. ASTM D422, Test Method for Particle-Size Analysis of Soils.
   3. ASTM D698, Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft^3 (600 kN-m/m^3)).
   4. ASTM D1556, Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   5. ASTM D1557, Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
   6. ASTM D2216, Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
   7. ASTM D4253, Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
   8. ASTM D4254, Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
   9. ASTM D4318, Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
   10. ASTM D6938, Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
   11. ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.

12. New York State Department of Transportation (NYSDOT) Standard Specifications (USC).

1.3 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning:
   1. "Subgrade" is the uppermost surface of native soil material unmoved from cuts; the bottom of excavation.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Contractor's Testing Laboratory:
      a. Retain the services of independent testing laboratory to perform testing and determine compliance with the Contract Documents of the materials specified in this Section.
      b. Testing laboratory shall comply with ASTM E329 and requirements of Section 01 45 29.13, Testing Laboratory Services Furnished by Contractor.
      c. Testing laboratory shall be experienced in the types of testing required.
      d. Selection of testing laboratory is subject to Engineer's acceptance.

B. Quality Assurance Testing:
   1. Quality assurance testing is in addition to field quality control testing required under Part 3 of this Section.
   2. Materials used in the Work may require testing and retesting, as directed by Engineer, during the Project. Allow free access to material stockpiles and facilities at all times. Tests not specifically indicated to be performed at Owner's expense, including retesting of rejected materials and installed Work, shall be performed at Contractor's expense.
   3. Contractor's Testing Laboratory Scope:
      a. Collect samples and perform testing of proposed fill materials in the laboratory and in the field to demonstrate compliance of the Work with the Contract Documents.
      b. Testing laboratory shall perform testing required to obtain data for selecting moisture content for placing and compacting fill materials.
      c. Submit to Engineer and Contractor written report results of each test.
   4. Required Quality Assurance Material Testing by Contractor's Testing Laboratory:
      a. Gradation in accordance with ASTM D422. Perform one test of each material incorporated into the Work.
      b. Atterberg limits in accordance with ASTM D4318. Perform one test of the following types of materials incorporated into the Work: general fill, and pipe bedding material.
      c. Moisture/density relations in accordance with ASTM D698, ASTM D1557, ASTM D4253, or ASTM D4254, as applicable. Perform one test of each material incorporated into the Work.

d. Moisture content of stockpiled or borrow material in accordance with ASTM D2216. Perform one test of each material incorporated into the Work.

C. Regulatory Requirements:
1. Perform excavation work in compliance with requirements of authorities having jurisdiction and Laws and Regulations, including:
a. OSHA, 29 CFR Part 1926, Section .650 (Subpart P – Excavations).
b. New York Codes, Rules and Regulations (NYCRR), Title 16, Chapter VII, Subchapter F, Part 753, Protection of Underground Facilities (Code 53).
2. Obtain required permits and approvals for excavation and fill Work, including work permits from right-of-way owners and permits from environmental authorities having jurisdiction over discharge of water from excavations.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
1. Shop Drawings:
a. Modifications to the Work proposed due to intended excavation plan.
b. Laboratory Trial Batch Reports: Submit laboratory quality assurance test reports for materials and mix design tests.
c. Modifications to the Work proposed due to design of sheeting, shoring, bracing, cofferdams, and similar excavation supports

B. Informational Submittals: Submit the following:
1. Procedure Submittals:
a. Excavation Plan: Prior to starting excavation operations, submit written plan to demonstrate compliance with OSHA 29 CFR Part 1926.650. As a minimum, excavation plan shall include:
1) Name of Contractor's "competent person" in responsible charge of excavation and fill Work.
2) Excavation method(s).
3) Copies of required permits and approvals, from authorities having jurisdiction and affected utility owners, for excavation methods proposed.
4) Copies of required permits and approvals, from authorities having jurisdiction and affected utility owners, for excavation methods proposed.
b. Proposed compaction procedure and compaction equipment proposed for use. Where different procedures or equipment will be used for compacting different types of material or at different locations at the Site, indicate where each procedure and equipment item will be used.
2. Excavation Support Plan and Related Information Prepared by CONTRACTOR's Professional Engineer:
a. CONTRACTOR and CONTRACTOR's professional engineer shall prepare the following for submittal:
1) Sheeting and bracing, or other protective system(s) required.

2) Dewatering system.

b. Drawings shall be prepared by professional engineer qualified in the specialty involved. Do not submit calculations. ENGINEER's review and acceptance of submittal does not imply approval by ENGINEER of the associated Work. CONTRACTOR shall be solely responsible for designing, installing, operating and maintaining the system(s) necessary to satisfactorily perform all sheeting, bracing, protection, underpinning, and dewatering.

3. Quality Assurance Test Results Submittals:
   a. Submit results of quality assurance testing performed by in accordance with Paragraph 1.4.B of this Section, unless included as part of another submittal under this Section. Submit results for the following quality assurance testing:
      1) Tests on borrow fill material.
      2) Optimum moisture – maximum dry density curve for each type of fill material.
4. Field Quality Control Submittals:
   a. Submit results of testing and inspection performed in accordance with the field quality control Article in Part 3 of this Section, including:
      1) Field density testing.
5. Qualifications Statements:
   a. Professional engineer.
   b. Quality Assurance Testing laboratory. Submit name and qualifications of testing laboratory to be employed, and qualifications of testing laboratory's personnel that will perform quality assurance testing required in this Section.

1.6 SITE CONDITIONS

A. Soil borings and other exploratory operations may be made by Contractor, at no additional cost to Owner. Coordinate Contractor-performed test borings and other exploratory operations with Owner and utility owners as appropriate. Perform such explorations without disrupting or otherwise adversely affecting operations of Owner or utility owners. Comply with Laws and Regulations relative to required notifications.

B. Existing Structures:
   1. The Contract Documents show or indicate certain structures and Underground Facilities adjacent to the Work. Such information was obtained from existing records and is not guaranteed to be correct or complete. Contractor shall explore ahead of the excavation to determine the exact location of all existing structures and Underground Facilities. Existing structures and Underground Facilities shall be supported and protected from damage by Contractor. Immediately repair and restore existing structures and Underground Facilities damaged by Contractor without additional cost to Owner.
   2. Movement or operation of construction equipment over Underground Facilities shall be at Contractor's sole risk and only after Contractor has

prepared and submitted to Engineer and utility owners (as applicable), and received acceptance therefrom, a plan describing Contractor's analysis of the loads to be imparted and Contractor's proposed measures to protect structures and Underground Facilities during the Project.

3. Coordinate with utility owners for shut-off of services in active piping and conduits. When required by utility owner, Owner will assist Contractor with utility owner notifications. Completely remove buried piping and conduits indicated for removal and not otherwise indicated as being abandoned or to remain in place.
4. In general, service lines and laterals to individual houses and businesses are not shown; however, Contractor shall assume that a service exists for each utility owner to each house, business, and property.
5. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when such interruption is indicated in the Contract Documents or when allowed in writing by Engineer after acceptable temporary utility services are provided by Contractor for the affected structure or property.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Select Fill:
   1. Select Fill Type B shall be well-graded aggregate, meeting the requirements of NYSDOT Item 203.07, Select Granular Fill as defined by NYSDOT Standard Specification Section 203. Gradation shall be in accordance with the following, as specified in NYSDOT Section 203-2.02, Article C.

Sieve Sizes (Square Openings)	Percentage by Weight Passing Sieve
4-inches	100
No. 40	0 to 70
No. 200	0 to 15

B. General Fill:
   1. Material shall be free of: rock and gravel larger than three inches in any dimension, debris, waste, frozen materials, organic material, and other deleterious matter.
   2. Fill shall have a liquid limit not greater than 45, and plasticity index not greater than 25.
   3. On-Site materials may not be used as general fill, provide select fill or approved off-Site general fill materials. Prior to using off-Site material as general fill, furnish submittal for and obtain Engineer's approval of the material proposed for use.

C. Process Stone:

1. Select Fill Type A shall be well-graded aggregate, meeting the requirements of NYSDOT Item 304.14, Subbase Course, Type 4 as defined by NYSDOT Standard Specification Section 304. Gradation shall be in accordance with the following, as specified in NYSDOT Section 304, Table 304-1:

Sieve Sizes (Square Openings)	Percentage by Weight Passing Sieve
2-inches	100
1/4-inch	35 to 65
No. 40	5 to 40
No. 200	0 to 10

C. Subbase Material:
1. Select fill used as subgrade support shall be a coarse aggregate material meeting the gradation requirements of #57 or #78 aggregates in accordance with ASTM C33 or Aggregate Base Course (ABC)..

D. Drainage Fill:
1. Material shall be washed, uniformly-graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing 1.5-inch sieve and not more than five percent passing a No. 4 sieve.

E. Pipe Bedding Material:
1. Aggregate material shall be crushed stone and gravel, free of: rock or gravel larger than one-inch in any dimension, debris, waste, frozen materials, organic material and other deleterious matter. Material shall comply with gradation requirements below:

Sieve Sizes (Square Openings)	Percentage by Weight Passing Sieve
1-inch	100
3/8-inch	30 to 65
No. 4	25 to 55
No. 10	15 to 40
No. 40	8 to 20
No. 200	2 to 8

2. Select sand shall be defined as Sand Backfill, from Section 203-2.02, Paragraph I of the NYSDOT Standard Specifications. Select sand shall meet the requirements of Sections 203-1 and 203-2, of the NYSDOT Standard Specifications for materials and gradation. The gradation shall be as defined in Section 203-2.02, Paragraph I, of the NYSDOT Standard Specifications.

Sieve Sizes (Square Openings)	Percentage by Weight Passing Sieve
1/2-inch	100
1/4-inch	90 to 100
No. 200	0 to 5

F. Sand:

1. Material shall be sand consisting of clean, hard, durable, uncoated particles of quartz or other rock, free from lumps of clay, soft or flaky material, loam, organic or other injurious material. In no case shall sand containing lumps of frozen material be used.
2. Gradation: Material shall be uniformly graded from coarse to fine and shall meet the following gradation requirements:

Sieve Sizes (Square Openings)	Percentage by Weight Passing Sieve
3/8-inch	100
No. 4	95 to 100
No. 8	80 to 100
No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

2.2 SOURCE QUALITY CONTROL

A. Perform quality assurance testing, and submit results to Engineer, in accordance with the 'Quality Assurance" Article in Part 1 of this Section.

PART 3 – EXECUTION

3.1 INSPECTION

A. Provide Engineer with sufficient notice and with means to examine areas and conditions under which excavating, filling, and grading will be performed. Engineer will advise Contractor in writing when Engineer is aware of conditions that may be detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Dust Control:
   1. Control objectionable dust caused by Contractor's operation of vehicles and equipment, clearing, and other actions. To minimize airborne dust, apply water or use other methods subject to Engineer's acceptance and approval of authorities having jurisdiction.

3.3 DEWATERING

A. Dewatering – General:
   1. Provide and maintain adequate drainage and dewatering equipment to remove and dispose of all surface water and ground water entering excavations, or other parts of the Work and work areas. Keep each excavation dry during

excavation, subgrade preparation, and continually thereafter until the structure to be built therein is acceptable to Engineer and backfilling operations are completed and acceptable to Engineer.

2. Keep all working areas at the Site free of surface water at all times. Provide temporary drainage ditches and temporary dikes, and provide required temporary pumping and other work necessary for diverting or removing rainfall and all other accumulations of surface water from excavations and fill areas. Perform diversion and removal of surface water in manner that prevents accumulation of water behind permanent or temporary structures and at any other locations in the construction area where such accumulations may be detrimental.
3. Water used for working or processing, resulting from dewatering operations, or containing oils or sediments that will reduce the quality of the surface water or groundwater downstream of the point of discharge, shall not be directly discharged. Divert such waters through temporary settling basin or filter before discharging to surface water, groundwater, or drainage routes.
4. Contractor shall be responsible for condition of piping, conduits, and channels used for drainage and such piping, conduits, and channels shall be clean and free of sediment.
5. Remove water from excavations as fast as water collects.

B. Disposal of Water Removed by Dewatering System:
   1. Contractor's dewatering system shall discharge to a suitable location acceptable to Owner, in accordance with Laws and Regulations.
   2. Dispose of water removed from excavations in a manner that does not endanger health and safety, property, the Work, and other portions of the Project.
   3. Dispose of water in manner that causes no inconvenience to Owner, others involved in the Project, and adjacent and downstream properties.

3.4 EXCAVATION

A. Perform all excavation required to complete the Work as shown, specified, and required. Excavations shall include removing and handling of earth, sand, clay, gravel, hardpan, soft, weathered or decomposed rock, pavements, rubbish, and other materials within the excavation limits.

B. Excavation Protection:
   1. Provide excavation protection system(s) in accordance with Laws and Regulations to prevent injury to persons and property, including Underground Facilities.
   2. Excavation Less Than Five Feet Deep: Excavations in stable rock or in soil conditions where there is no potential for a cave-in may be made with vertical sides. Under all other conditions, excavations shall be shielded, or shored and braced.
   3. Excavations Greater Than Five Feet Deep: Excavations in stable rock may be made with vertical sides. Under all other conditions, excavations shall be shielded, or shored and braced.

C. Maintain excavations in dry condition in accordance with “Dewatering” Article in Part 3 of this Section.

D. Elevation of bottom of electrical duct bank shown is approximate. Engineer may direct such minor changes in dimensions and elevations as may be required to secure a satisfactory footing.

E. When excavations are made below required grades without written order of Engineer, fill such excavations with compacted select fill, as directed by Engineer, at Contractor’s expense.

F. Extend excavations sufficiently on each side of structures, footings, and similar construction to allow setting of forms, installation of excavation supports, and the safe sloping of banks, as necessary.

G. Subgrades – General:
   1. Subgrades shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud, muck, and other soft or unsuitable materials; and shall remain firm and intact under all construction operations. Subgrades that are otherwise solid but become soft or mucky on top due to construction operations shall be reinforced with select fill. Finished elevation of stabilized subgrades shall not be above subgrade elevations shown.
   2. If, in Engineer’s opinion, subgrade becomes softened or mucky because of construction delays, failure to dewater properly, or other cause within Contractor’s control, subgrade shall be excavated to firm material, trimmed, and backfilled with select fill material at Contractor’s expense.

H. Utility Trench Preparation:
   1. Not more than 20 feet of trench may be opened in advance of installing pipe in trench.
   2. Trench width shall be minimized to greatest extent practical, and shall comply with the following:
      a. Trench width shall be sufficient to provide space for installing and inspecting duct bank. Refer to the Drawings for trench requirements. In no case should trench be wider than duct bank width plus two feet, unless otherwise shown or indicated.
      b. Trench width shall be sufficient for shoring and bracing, or shielding and dewatering.
      c. Do not use excavating equipment that requires the trench to be excavated to excessive width.
   3. Depth of trench shall be as shown or indicated. If required and approved by Engineer in writing, depths may be revised.
   4. Where Engineer considers existing material beneath bedding material unsuitable, remove and replace such unsuitable material with select fill material.

I. Excavated Materials to be Used as Fill:

1. Previously-excavated materials may not be used as fill unless approved by the Engineer.
2. Dispose of excess soil material and waste materials as specified in this Section.

3.5 UNAUTHORIZED EXCAVATION

A. All excavations outside lines and grades shown or indicated and that are not approved by Engineer, together with removing and disposing of the associated material, shall be at Contractor's expense. Fill unauthorized excavations with properly-compacted select fill material at Contractor's expense.

3.6 EROSION AND SEDIMENT CONTROLS

A. Provide temporary erosion and sediment controls in accordance with Section 01 57 05, Temporary Controls. When applicable, also comply with requirements of the erosion and sediment control plan approved by authorities having jurisdiction.

3.7 SHEETING, SHORING, AND BRACING

A. General:
   1. Provide sheeting, shoring, bracing, and similar excavation supports as shown, specified, and required for the Work.
   2. Contractor is responsible for adequacy of all sheeting, shoring, bracing, and similar excavation supports.
   3. Materials:
      a. Previously-used materials shall be in good condition, and shall not be damaged or excessively pitted. All steel or wood sheeting designated to remain in place shall be new. New or used sheeting may be used for temporary sheeting, shoring, and bracing.
      b. All steel work for sheeting, shoring, bracing, and other excavation supports, shall be in accordance with ANSI/AISC 360, except that field welding will be allowed.
   4. As excavation progresses, carry down shoring, bracing, and similar excavation supports to required elevation at bottom of excavation.
   5. Comply with Laws and Regulations regarding sheeting, shoring, bracing, and similar excavation supports.
   6. Maintain sheeting, shoring, bracing, bracing, and other excavation supports in excavations regardless of time period excavations will be open.
   7. Unless otherwise shown, specified, or directed, remove materials used for temporary construction when the Work is completed. Perform such removal in manner not injurious to the structures and Underground Facilities, their appearance, and adjacent construction.

B. Removal of Sheeting and Bracing:
   1. Remove sheeting and bracing from excavations, unless otherwise directed by Engineer in writing. Perform removal to avoid damaging the Work and

adjacent construction. Removal shall be equal on both sides of excavation to ensure no unequal loads on structures and Underground Facilities.

2. Defer removal of sheeting and bracing, where removal may cause soil to come into contact with concrete, until the following conditions are satisfied:
   a. Concrete has cured for not less than seven days.
   b. Wall and floor framing, up to and including grade level floors, is in place.

3.8 TRENCH SHIELDS

A. Excavation of earth material below bottom of trench shield shall not exceed the limits established in Laws and Regulations.

B. When using a shield for installing piping:
   1. Portions of trench shield extending below the mid-diameter of an installed, rigid pipe, such as prestressed concrete pipe and other types of rigid pipe, shall be raised above the pipe's mid-diameter elevation prior to moving the shield along the trench for further construction.
   2. Bottom of shield shall not at any time extend below mid-diameter of installed pipe that is flexible or has flexing capability, such as steel, ductile iron, PVC, CPVC, polyethylene, and other pipe that has flexing capability.

C. When using a shield for installing structures, bottom of the shield shall not extend below the top of the bedding for the structures.

D. When removing the shield or moving the shield ahead, exercise extreme care to prevent moving piping, structures, and other Underground Facilities, and prevent disturbance of bedding material for piping, structures, and other Underground Facilities. When piping, structures, or Underground Facilities are disturbed, remove and reinstall the disturbed items in accordance with the Contract Documents.

3.9 FILL AND COMPACTION – GENERAL PROVISIONS

A. Provide and compact all fill required for the finished grades as shown and as specified in this Section.

B. Place fill in excavations as promptly as progress of the Work allows, but not until completing the following:
   1. Engineer's authorization after observation of construction below finish grade.
   2. Inspection, testing, approval, and recording of locations of Underground Facilities.
   3. Removal of concrete formwork.
   4. Removal of shoring and bracing, and filling of voids with satisfactory materials.
   5. Removal of trash and debris.
   6. Field testing of Underground Facilities including conduits.

C. Fill that includes organic materials or other unacceptable material shall be removed and replaced with approved fill material in accordance with the Contract Documents.

D. Placement – General:
   1. Place fill to the grades shown or indicated. Bring up evenly on all sides fill around structures and Underground Facilities.
   2. Place fill materials at moisture content and density as specified in this Article's requirements on compaction density. Furnish and use equipment capable of adding measured amounts of water to the fill materials to bring fill materials to a condition within required moisture content range. Furnish and use equipment capable of discing, aerating, and mixing the fill materials to ensure reasonable uniformity of moisture content throughout the fill materials, and to reduce moisture content of borrow materials by air drying, when necessary. When subgrade or lift of fill materials requires moisture-conditioning before compaction, fill material shall be sufficiently mixed or worked on the subgrade to ensure uniform moisture content throughout the lift of material to be compacted. Materials at moisture content in excess of specified limit shall be dried by aeration or stockpiled for drying.
   3. Perform compaction with equipment suitable for the type of fill material placed. Select and use equipment capable of providing the minimum density required in the Contract Documents. Use light compaction equipment, with equipment gross weight not exceeding 7,000 pounds within horizontal distance of ten feet from the wall of existing, below-grade structures. Furnish and use equipment capable of compacting in restricted areas next to structures and around piping and Underground Facilities. Effectiveness of the equipment selected by Contractor shall be tested at start of compacted fill Work by constructing a small section of fill within the area where fill will be placed. If tests on the test section of fill indicate that required compaction is not obtained, do one or more of the following: increase the amount of coverages, decrease the lift thicknesses, or use different compactor equipment.
   4. Place fill materials in horizontal, loose lifts, not exceeding specified uncompacted thickness. Place fill in a manner ensuring uniform lift thickness after placing. Mechanically compact each lift, by not less than two complete coverages of the compactor. One coverage is defined as the conditions reached when all portions of the fill lift have been subjected to the direct contact of compactor's compacting surface. Compaction of fill materials by inundation with water is unacceptable.
   5. Do not place fill materials when standing water is present on surface of the area where fill will be placed. Do not compact fill when standing water is present on the fill to be compacted. Do not place or compact fill in a frozen condition or on top of frozen material. Fill containing organic materials or other unacceptable material previously described shall be removed and replaced prior to compaction.
   6. If required densities are not obtained because of improper control of placement or compaction procedures, or because of inadequate or improperly-functioning compaction equipment, Contractor shall perform all work

required to provide the required densities. Such work shall include, at no additional cost to Owner, complete removal of unacceptable fill areas and replacement and re-compaction until acceptable fill is provided.

7. Repair, at Contractor's expense, observed or measured settlement. Make repairs and replacements as required within 30 days after being so advised by Engineer.

E. Fill Against Concrete:
   1. Placing fill against concrete below finished grade is not allowed until the concrete has attained its specified strength, as determined by duration of concrete curing and testing of field-cured concrete cylinders. Requirements for strength and curing time are in Section 03 30 00, Cast-in-Place Concrete.
   2. Elevation of fill placed against concrete walls shall not differ by more than two feet on each side of walls, unless walls are adequately braced or all floor framing is in place up to and including grade level slabs.
   3. Backfill structural foundation units as soon as practicable, in accordance with this Section, after concrete has gained sufficient strength to avoid damage, to avoid ponding of surface water and accumulation of debris.
   4. Where fill is placed against waterproofed surface, exercise care that waterproofing material is not damaged.

F. Fill in Electrical Ductbank Trenches:
   1. Provide general fill for full depth of electrical ductbank trench, below and above electrical ductbank. Where one ductbank passes beneath another pipe or ductbank, provide select fill to the elevation of the bottom of upper ductbank or pipe, as applicable.
   2. Placing and compacting fill in electrical ductbank trenches shall comply with requirements of Paragraph "G. Fill in Pipe Trenches", of this Article.

G. Fill in Pipe Trenches:
   1. Piping Installed in Fills Above Pre-construction Grade:
      a. Prior to installing piping, place the fill in accordance with the Contract Documents until the fill reaches a minimum elevation two feet higher than the top of piping to be installed. Excavate the trench; install the piping, and backfill. Subsequently provide the remainder of the fill required for the Work.
   2. Piping trenches may be backfilled prior to testing of piping, unless nature of the test requires observation of pipe during testing. Do not construct building or structure over piping until piping has been successfully tested and passed.
   3. Pipe Bedding: Pipe bettering material shall be as follows:
      a. Install PVC, CPVC, HDPE, and FRP piping on a layer of sand. Sand shall extend to 12 inches above top of pipe and to the trenchwalls on each side of the pipe.
      b. Unless otherwise shown, install other types of piping on not less than six-inch layer of aggregate pipe bedding material. Aggregate pipe bedding material shall extend 12 inches above top of the pipe.

4. Placing and Compacting Pipe Trench Fill: Unless otherwise shown, placement and compaction of pipe trench fill materials shall comply with the following:
    a. Pipe bedding material shall be spread and the surface graded to provide a uniform and continuous support beneath piping at all points between bell holes or pipe joints. Slight disturbance of installed pipe bedding material surface during withdrawal of pipe slings or other lifting tackle is acceptable.
    b. After each pipe's bedding material has been graded, and the piping has been aligned, joined in accordance with the Contract Documents, and placed in final position on bedding material, provide and compact sufficient pipe trench fill material under and around each side of the pipe and back of the bell or end thereof to hold piping in proper position and maintain alignment during subsequent pipe jointing and embedment operations. Deposit and compact pipe trench fill material uniformly and simultaneously on each side of piping to prevent lateral displacement of piping. Place and compact pipe trench fill material to an elevation 12 inches above top of pipe, unless otherwise shown or specified.
    c. Each layer of pipe trench fill material shall be compacted by at least two complete coverages of all portions of surface of each lift using appropriate compaction equipment.
    d. Method of compaction and compaction equipment used shall be appropriate for material to be compacted and shall not transmit damaging shocks to the piping.

H. Temporary Pavement:
1. Place 6 inches of temporary asphalt concrete pavement immediately after filling excavations in paved roadways and other paved areas that will remain for permanent use.
2. Maintain surface of paved area over the fill in good and safe condition during progress of the Work, and promptly fill depressions over and adjacent to the fill area caused by settlement of fill.
3. Permanent replacement pavement shall be equal to that of the existing roadways, unless otherwise shown or specified.

I. Subbase Placement:
1. Provide subbase material where shown to the limits shown or indicated.
2. Place subbase material in compacted lifts not exceeding depth of six inches each.

J. Drainage Fill Placement:
1. Provide drainage fill material where shown to the limits shown or indicated.
2. Place drainage fill material in compacted layers of uniform thickness not exceeding depth of six inches each. Compact lifts of drainage fill using suitable compaction equipment.

K. Compaction Density Requirements:

1. Minimum density for fill materials shall be 100 percent of maximum density obtained in the laboratory in accordance with ASTM D698. Compaction of fill materials less than five feet below final grade, behind concrete walls, and pipe bedding materials when not located below structures or pavement shall be 95 percent of maximum density in accordance with ASTM D698.
2. Place fill in trenches below Underground Facilities, foundations or paved areas in horizontal, uncompacted lifts not greater than eight inches deep, and thoroughly compact each lift before placing the next lift. In other pipe trenches, horizontal uncompacted lifts shall be six inches deep.
3. Fill shall be wetted and thoroughly mixed to achieve optimum moisture content plus-or-minus three percent, with the following exceptions:
   a. On-site clayey soils: Optimum to plus three percent.
4. Replace natural, undisturbed soils or compacted soil subsequently disturbed or removed by construction operations with materials compacted as indicated.
5. Field quality control testing for density; to verify that specified density was obtained, will be performed during each day of compaction Work. Responsibility for field quality control testing is specified in the "Field Quality Control" Article in Part 3 of this Section.
6. When field quality control testing indicates unsatisfactory compaction, provide additional compaction necessary to obtain the specified compaction. Perform additional compaction Work at no additional cost to Owner until specified compaction is obtained. Such work includes complete removal of unacceptable (as determined by Engineer) fill areas and replacement and re-compaction until acceptable fill is provided in accordance with the Contract Documents.

L. Replacement of Unacceptable Excavated Materials: In cases where over-excavation to replace unacceptable soil materials is required, backfill the excavation to required subgrade with select fill material and thoroughly compact in accordance with the "Compaction Density Requirements" in this Article. Slope the sides of excavation in accordance with the maximum inclinations specified for each structure location.

3.10 GRADING

A. General:
   1. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas.
   2. Smooth subgrade surfaces within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free of irregular surface changes, and shall comply with the following:
   1. Grassed Areas: Finish areas to receive topsoil or special cover to within not more than one inch above or below the required subgrade elevations.

2. Sidewalks: Shape surface of areas under sidewalks to line, grade, and cross section, with finish surface not more than one inch above or below the required subgrade elevation.
3. Pavements including Permeable Pavers: Shape surface of areas under pavement to line, grade, and cross section, with finish surface not more than 1/2-inch above or below the required subgrade elevation.

C. Grading Surface of Fill Under Concrete 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 ten foot straight edge.

D. Compaction:
1. After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

3.11 PAVEMENT SUBBASE COURSE

A. General:
1. Place subbase material, in layers of specified thickness, over ground surface to support pavement base course.
2. After completing filling and grading, shape and compact pavement subgrade to an even, firm foundation in accordance with this Section. Remove unsuitable subgrade materials, including soft materials, boulders, vegetation, and loose stones, and replace with compacted fill material as directed by Engineer.

B. Grade Control:
1. During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Placing of Pavement Subbase Course:
1. Place subbase course material on prepared subgrade in layers of uniform thickness, in accordance with indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placing operations.
2. After completing compaction, other than that necessary for bringing material for the next course, do not haul or drive over the compacted subbase.
3. Do not install pavement subbase in excess of 500 feet in length without compacting to prevent softening of the subgrade.
4. If subgrade material becomes churned up into or mixed with the subbase material, remove the mixed material and replace with clean, compacted subbase material.

3.12 DISPOSAL OF EXCAVATED MATERIALS

A. General:
1. Previously excavated materials may not be used as fill.

2. Disposal of materials shall be in compliance with Laws and Regulations, at no additional cost to Owner.

3.13 TEMPORARY BARRIERS

A. General:
   1. Provide temporary barrier surrounding excavations and excavation work areas for protection of persons and property. Temporary barriers supplement the requirements of Section 01 55 26, Maintenance and Protection of Traffic.
   2. Provide temporary barriers where shown or indicated, and where necessary to protect persons and property. At minimum, provide temporary barriers for all excavations that remain open overnight or longer.

B. Temporary Snow Fence-type Barriers:
   1. Unless shown or indicated otherwise, temporary barrier shall be not less snow fence-type fencing, four feet high.
   2. During non-working hours, completely enclose all sides of excavation with temporary barrier.
   3. Fencing shall be constructed of vertical hardwood slats measuring not less than 1.5 inches by 1/4-inch interwoven with strands of horizontal wire, or shall be of equivalent plastic construction.
   4. Supports: Adequately support barrier to protect persons and property. Supports shall engage a substantial number of fence line wire in the proper position.
   5. Maintenance: Maintain temporary snow fence-type barriers as required. Repair or replace when damaged. Reinstall barriers where barrier installation has degraded over original temporary barrier installation.
   6. Removal: Remove the barriers from the Site when excavation is properly filled, or when directed.

3.14 FIELD QUALITY CONTROL

A. Site Tests: Employ a testing laboratory to perform field quality control testing.
   1. Testing Laboratory Scope:
      a. Perform field moisture content and density tests to ensure that the specified compaction of fill materials has been obtained.
      b. Tests of actual unconfined compressive strength or bearing tests on each stratum.
      c. Report results of each test to Engineer.
   2. Required Material Tests:
      a. Compaction: Comply with ASTM D1556 and ASTM D6938, as applicable.
   3. Authority and Duties of Testing Laboratory:
      a. Technicians representing the testing laboratory shall inspect the materials in the field, perform testing, and report findings to Engineer. When materials furnished or the Work performed does not comply with

the Contract Documents, technician will direct attention of Engineer and Contractor to such failure.

b. Technician will not act as foreman or perform other duties for Contractor. Work will be checked as it progresses, but failure to detect defective Work or non-complying materials shall not in any way prevent later rejection when defect is discovered, nor shall it obligate Engineer for Substantial Completion or final acceptance. Technicians are not authorized to revoke, alter, relax, enlarge, or release requirements of the Contract Documents, or to approve or accept any portion of the Work.

4. Responsibilities and Duties of Contractor:
   a. Use of testing laboratory shall in no way relieve Contractor of the responsibility to provide materials and Work in full compliance with the Contract Documents.
   b. To facilitate testing laboratory, Contractor shall advise testing laboratory at least two days in advance of filling operations to allow for completion of field quality control testing and for assignment of personnel.
   c. It shall be Contractor's responsibility to accomplish the specified compaction for fill and other earthwork. Contractor shall control construction operations by confirmation tests to verify and confirm that Contractor has complied, and is complying at all times, with the Contract Documents relative to compaction, control.
   d. Contractor shall demonstrate adequacy of compaction equipment and procedures before exceeding one or more of the following quantities of earthwork. Each test location shall include tests for each layer, type, or class of fill to finish grade.
      1) 200 linear feet of trench fill.
      2) 10 cubic yards of select fill.
      3) 100 cubic yards of general fill.
      4) 50 cubic yards of subbase material.
5. Testing laboratory will inspect and indicate acceptable subgrades and fill layers before construction work is performed thereon. Testing of subgrades and fill layers shall be taken as follows:
   a. Trenches for Structures, and Underground Facilities (including buried ductbanks):
      1) In Open Fields: Two locations.
      2) Crossing Paved Roads: Two locations along each crossing.
      3) Under Pavement Cuts or Within Two Feet of Pavement Edges: One location every 400 linear feet.
   b. Footing Subgrade: For each stratum of soil on which footings will be placed, perform not less than one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Engineer.
   c. For Select Fill: On 30-foot intervals on all sides of the structure for every compacted lift, but not less than one per lift on each side of the structure for structures less than 60 feet long on a side.
   d. For General Fill: One per 1,000 square feet on every compacted lift.

e. Subbase Material: One per 1,000 square feet on every compacted lift.

6. Periodic compliance tests will be made by Engineer to verify that compaction is complying with the requirements specified, at no cost to Contractor. Contractor shall remove the overburden above the level at which Engineer wishes to test and shall fill and re-compact the excavation after testing is complete.
7. If testing laboratory reports or inspections indicate subgrade, fills, or bedding compaction below specified density, Contractor shall remove unacceptable materials as necessary and replace with specified materials and provide additional compaction at Contractor's expense until subgrades, bedding, and fill are acceptable. Costs for retesting of subgrade, fills, or bedding materials that did not originally comply with specified density shall be paid by Contractor.

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SECTION 31 63 29

DRILLED CONCRETE PIERS

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish, install and test drilled concrete piers.
   2. Extent of drilled concrete piers is as shown on the Project Drawings.

B. Drilled concrete pier Description:
   1. Piers consist of drilled 16-inch concrete pier designed as a steel reinforcement surrounded by concrete.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
   1. AMERICAN CONCRETE INSTITUTE (ACI)
      a. ACI 117 (2010; Errata 2011) Specifications for Tolerances f or Concrete Construction and Materials and Commentary
      b ACI 301 (2016) Specifications for Structural Concrete
      c. ACI 304R (2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
      d. ACI 305R (2010) Guide to Hot Weather Concreting
      e. ACI 306.1 (1990; R 2002) Standard Specification for Cold Weather Concreting
      f. ACI 318 (2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)
      g. ACI 336.1 (2001) Specification for the Construction of Drilled Piers
      h. ACI SP-66 (2004) ACI Detailing Manual
   2. AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
      a. ASCE 7-16 (2017; Errata 2018; Supp 1 2018) Minimum Design Loads and Associated Criteria for Buildings and Other Structures
   3. AMERICAN WELDING SOCIETY (AWS)
      a. AWS A5.1/A5.1M (2012) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
      b. AWS D1.1/D1.1M (2020) Structural Welding Code – Steel
      c. AWS D1.4/D1.4M (2011) Structural Welding Code - Reinforcing Steel
   4. ASTM INTERNATIONAL (ASTM)

a. ASTM A615/A615M (2020) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
b. ASTM A1064/A1064M (2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
c. ASTM C31/C31M (2019a) Standard Practice for Making and Curing Concrete Test Specimens in the Field
d. ASTM C39/C39M (2020) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
e. ASTM C94/C94M (2020) Standard Specification for Ready-Mixed Concrete
f. ASTM C143/C143M (2020) Standard Test Method for Slump of Hydraulic-Cement Concrete
g. ASTM C150/C150M (2020) Standard Specification for Portland Cement
h. ASTM C172 (2010) Standard Practice for Sampling Freshly Mixed Concrete

5. CONCRETE REINFORCING STEEL INSTITUTE (CRSI)
   a. CRSI 10MSP (2018) Manual of Standard Practice
6. U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)
   a. FHWA NHI-10-016 (2010) Drilled Piers: Construction Procedures and LRFD Design Methods
7. U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)
   a. 29 CFR 1926.651 Specific Excavation Requirements

1.3 CONTRACTOR QUALIFICATIONS

A. The CONTRACTOR shall assign a superintendent or foreman with a minimum of two (2) years of experience in the supervision of drilled concrete pier construction.

1.4 QUALITY ASSURANCE

A. General:
   1. Install drilled pier foundations in accordance with applicable requirements as described by ACI 336.1, and FHWA NHI-10-016.

B. Sequencing and Scheduling:
   1. Submit a detailed installation plan describing the schedule for drilling and/or excavation, installation of steel reinforcement and concrete placement with anticipated site conditions so that each excavated pier is poured the same day that the drilling is performed.

C. Inspection Criteria:
   1. Design inspection activities to minimize delays while insuring the intent of the foundation design and special inspection included in design drawings.

D. Qualification of Excavation Contractor:
   1. An experienced excavator with five (5) years experience and licensed in the State of New York specialized in excavating and installing work similar in material, design, and extent to that indicated for this Project. Submit certificates substantiating the Qualifications of Excavator.

E. Qualification of Professional Engineer:
   1. Provide engineering services by an authorized engineer currently licensed in the State of New York having a minimum of four (4) years experience as an engineer knowledgeable in drilled pier foundation design analysis, protocols and procedures for the ACI 336.1, FHWA NHI-10-016, ASCE 7-16, and the International Building Code Submit certificates substantiating the Qualifications of Engineer.

F. Welding Qualifications:
   1. Provide and maintain qualified procedures and personnel according to AWS D1.1/D1.1M, AWS D1.4/D1.4M, and AWS A5.1/A5.1M. Submit Welding Certificates to the ENGINEER.

D. Pre-Construction Conference:
   1. After submittals are received and approved but before drilled pier excavation and foundation work, including associated work, is performed, the ENGINEER will hold a pre-construction conference to review the following:
      a. The drawings, specifications and the geotechnical report.
      b. Finalize construction schedule and verify availability of materials, Excavator's personnel, equipment, and facilities needed to make progress and avoid delays.
      c. Methods and procedures related to drilled pier foundation installation, including engineer's written instructions.
      d. Support conditions for compliance with requirements, including alignment between foundation system and erection of structural members.
      e. Governing regulations and requirements for, certificates, insurance, tests and inspections if applicable.
      f. Temporary protection requirements for foundation assembly during and after installation.

E. Concrete Testing Service:
   1. OWNER shall employ a testing laboratory to perform material evaluation tests.
   2. Materials and installed Work may require testing and retesting, as directed by OWNER, at any time during the progress of the Work. Allow free access to material stock and facilities at all times. Tests not specifically indicated to be done at OWNER'S expense, including the retesting of rejected materials and installed Work, shall be done at CONTRACTOR'S expense.

1.5 PROJECT CONDITIONS

A. Existing Conditions:
   1. Locate existing underground utilities before excavating drilled pier foundations. If existing utilities are to remain in place, provide protection during drilled pier operations.

B. Interruption of Existing Utilities:
   1. Do not interrupt any utility to occupied facilities unless directed in writing by the ENGINEER.

C. Weather Limitations
   1. Proceed with installation preparation only when existing and forecasted weather conditions permit work to proceed without water entering into the area of excavation.

1.6 SUBMITTALS

A. Submit the following:
   1. Drilled concrete pier Installation Plan, addressing at minimum the following items:
      a. Equipment, materials, means, methods, and proposed installation procedures to be utilized.
      b. Description and sketch or catalog data of the drilled concrete pier installation equipment.
      c. Proposed drilled concrete pier installation sequence referenced to the drilled concrete pier plan as shown on the Project Drawings.
   2. Concrete Mix Design
   3. Qualification Statements:
      a. Qualifications of drilled concrete pier contractor and personnel supervising the performance of drilled concrete pier installation including summary of project experience, location, and references.
   4. Installation Record, addressing at minimum the following items for each drilled concrete pier:
      a. Drilled concrete pier location and number, rate of operation of drilled concrete pier installation equipment, drilled concrete pier dimensions, tip elevation, elevation of butt, ground elevation, drilled concrete pier deviation, quantity of concrete placed and any unusual occurrences during drilled concrete pier installation.

B. Preconstruction Submittals:
   1. Installation Plan

C. Shop Drawings:
   1. Drilled Pier Diameters
   2. Depth of Test Holes
   3. Top and Bottom of Pier Elevations
   4. Steel Reinforcement

5. Anchor Bolt Locations
6. Accessories

D. Design Data:
   1. Drilled Pier Foundation Design Analysis
   2. Mix Design Data

E. Test Reports:
   1. Soils Report
   2. Ground Water Conditions
   3. Load Test
   4. Penetration Test
   5. Slump
   6. Concrete Compressive Strength

F. Certificates:
   1. Bill of Lading for Ready-Mix Concrete Deliveries
   2. Steel Reinforcement
   3. Welding Certificates
   4. Excavation and Drilling Equipment
   5. Qualifications of Excavator
   6. Qualifications of Engineer

PART 2 PRODUCTS

2.1 DESIGN REQUIREMENTS

A. Submit design data for the following:
   1. Drilled pier design. installation plan to define the means and methods to be used for construction.
   2. Mix design data in accordance with Specification 03 00 05.

B. Assembly:
   1. Installation drawings are to include, but not limited to, the following items indicating a completely dimensioned layout and location of drilled piers and concrete placement for foundation system. Submit detailed shop drawings for the following:
      a. Drilled pier diameters
      b. Depth of test holes
      c. Top and bottom of pier elevations
      d. Steel reinforcement
      e. Anchor bolt locations
      f. Accessories

2.2 EQUIPMENT

A. Drilling and Excavation Equipment:

1. Provide drilling and excavation equipment having adequate capacity, including but not limited to, power, torque and down thrust to excavate a hole of diameter and depth indicated. Also provide excavation and over-reaming tools of adequate design, size and strength to perform the work indicated.
2. Provide special drilling equipment including, but not limited to, rock core barrels, rock tools, air tools and other equipment as necessary to construct the pier excavation to the size and depth indicated when materials encountered can not be drilled using earth augers and/or over-reaming tools.
3. Submit certificates substantiating appropriate selection of excavation and drilling equipment.

2.3 MATERIALS

A. Steel Reinforcement:
   1. Deformed Steel Bars:
      a. Steel bars conforming to ASTM A615/A615M, Grade 60 ksi and ACI 318.
   2. Plain Steel Wire:
      a. Steel wire conforming to ASTM A1064/A1064M.
   3. Ready-Mix Concrete:
      a. Ready-Mix concrete and mix design conforming to ACI 117, ACI 301, and ACI 304R, minimum compressive strength 4,500 psi at 28 days. Maximum aggregate size shall not exceed 0.5 inch. Slump results between 5 to 6 inches, according to ASTM C143/C143M.
      b. Portland cements conforming to ASTM C150/C150M, Type II. Provide one brand and type of cement for formed concrete having exposed-to-view finished surfaces.
      c. Potable water conforming to ASTM C94/C94M.
      d. Measure, batch, mix and deliver concrete according to ASTM C94/C94M and furnish batch ticket information.

PART 3 EXECUTION

3.1 PREPARATION

A. Protect existing structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, vibration, and other hazards created by drilled pier foundation operations.

B. Provide Fall Protection as required by 29 CFR 1926.651.

3.2 INSTALLATION

A. Construction Criteria:
   1. Provide equipment for checking the dimensions and alignment of each pier excavation. Determine dimensions and alignment jointly with the contractor

and engineer. Measure final pier depths with appropriate weighted tape measure or other approved method after cleaning.

2. Provide and install monolithically cast-in-place concrete drilled pier foundation to the sizes indicated.
3. Tolerances:
   a. Maximum variation of the center of any pier foundation from the required location: 2 inches, measured at the ground surface.
   b. Bottom Diameter: Minus zero, plus 6 inches, measured in any direction.
   c. Maximum variation from plumb: 1:40.
   d. Maximum bottom level: Minimum rock socket depth Minus zero, plus 2 inches.

B. Excavation:
1. Accomplish excavation of pier foundations by standard excavation methods including, but not limited to, conventional augers fitted with soil and/or rock teeth, core drilling fitted with core bit, or under-reaming tools attached to drilling equipment of adequate size, power, torque and down thrust necessary for the work.
2. Perform excavation through whatever materials that are encountered to the dimensions, depths and applicable ACI 336.1 tolerances.
3. Protect excavated walls with temporary watertight steel casings of sufficient length to prevent water intrusion, cave-ins, displacement of surrounding earth, and injury to personnel and damage to construction operations.
4. Excavate piers for drilled foundations to ensure a minimum rock socket depth of 5 feet at each pier location elevations. Remove loose debris, materials and/or muck to make bottom surfaces level within ACI 336.1 tolerances.
5. All drilled pier rock sockets shall be inspected to verify rock quality. Inspection may be accomplished by direct observation, by video methods or by a core boring performed prior to the drilling of the socket.
6. Remove water from excavated pier prior to concrete placement.

C. Steel Reinforcement:
1. Comply with recommendations in the CRSI "Manual of Standard Practice" CRSI 10MSP for fabricating, placing and supporting reinforcement. Shop fabricate steel reinforcement in accordance with ACI SP-66.
2. When practicable, deliver the reinforcement cage assembly to the jobsite as a complete unit ready for installation. Should it be necessary to make any additional connections and/or splices, provide as indicated on the approved shop drawings, at-grade level prior to lowering the complete assembly into the hole.
3. Clean reinforcement of loose rust, mill scale, earth and other foreign materials. Do not tack weld crossing reinforcing bars. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
4. Lower reinforcement steel into the hole in such a manner as to prevent damage to the walls of the excavation. Place, tie and/or clip cage symmetrically about the axis of the pier. Use centering devices securely attached to the cage to clear the pier walls and maintain the cage in place throughout the concrete placement operations.

5. Cooperate with other trades in setting of anchor bolts, inserts, and other embedded items. Where conflicts occur between reinforcing and embedded items, notify the ENGINEER in order to reconcile conflicts before concrete placement. Position and support anchors and embedded items with appropriate accessories.
6. Use templates to set anchor bolts, leveling plates and other accessories required for structure erection. Provide blocking and/or holding devices to maintain required anchoring positions during final concrete placement.

D. Concrete Placement:
1. Keep all equipment, including but not limited to, mixers, pumps, hoses, tools and screeds clean and free of set concrete throughout the placement operation.
2. Convey concrete from the mixer to place of deposit by best industry methods that prevents segregation and loss of material. Size and design the equipment for conveying concrete to ensure uniform, continuous placement of concrete.
3. Place concrete in accordance with ACI 318.
4. Place concrete in a continuous operation and without segregation into dry excavations whenever possible after inspection and written approval by the ENGINEER. Use all practicable means to obtain a dry excavation before and during concrete placement.
5. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. When hot weather conditions exist that would impair quality and strength of placed concrete, comply with ACI 305R. Comply with ACI 306.1 for cold-weather protection.
6. A minimum of 50 percent of the base for each pier is to be less than 1/2 inch of debris at the time of concrete placement. Maximum depth of debris at any place on the base of the pier is not to exceed 1-1/2 inches. Pier cleanliness is to be determined by the engineer by visual inspection.

3.3 FIELD QUALITY CONTROL

A. Test Reports:
1. As a minimum, submit the following test reports and data:
   a. Soils Report
   b. Ground Water conditions
   c. Load Test
      1) The CONTRACTOR shall submit for review and acceptance the proposed drilled pier load testing procedure. The testing program shall be provided 2 weeks prior to starting the load testing. This drilled pier verification load testing proposal shall be in general conformance with ASTM D-1143 +/or D-3689, and shall indicate the minimum following information:
         a) Type and accuracy of apparatus for measuring load.
         b) Type and accuracy of apparatus for applying load.
         c) Type and accuracy of apparatus for measuring the pile deformation.
         d) Type and capacity of reaction load system, including sealed design drawings.

e) Hydraulic jack calibration report.

d. Penetration Test
e. Slump
f. Concrete
g. Compressive Strength

2. Sample and test concrete for quality control during placement.
3. Sample freshly placed concrete for testing in accordance with ASTM C172.
4. Make concrete test specimens for compressive strength at 7 and 28 days for each design mix conforming to ASTM C31/C31M. Compression test concrete in accordance with ASTM C39/C39M.
5. Test Slump at plant for each design mix in accordance with ASTM C143/C143M.

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SECTION 32 01 91

TREE PROTECTION AND TRIMMING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and perform tree protection and trimming.
   2. Extent of plantings to remain are shown. Extent of tree protection and trimming may include, but is not limited to, crown cleaning, crown thinning, crown raising, crown reduction, vista pruning and crown restoration; in addition to soil aeration, trench cut supervision and hand tunneling; drip line, root zone and tree trunk protection, and temporary barriers.
   3. Types of products required include the following:
      a. Temporary protection barriers.
      c. Drainage fill.
      d. Topsoil.
      e. Drain tile.
      f. Straw.
      g. Stone.
      h. Burlap.
      i. Accessories.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate construction activities and the installation of items that pass within the drip line, or that affect existing grade, in areas where existing plantings are to remain.

C. Related Sections:
   1. Section 31 23 05, Excavation and Fill.
   2. Section 32 31 00, Fences.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American National Standards Institute, (ANSI).
      a. ANSI 300, Tree Care Operations - Tree, Shrub, and Other Woody Plant Maintenance - Standard Practices.
   2. American Society for Testing and Materials, (ASTM).
      a. ASTM C 700, Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
      b. ASTM D 448, Classification for Sizes of Aggregate for Road and Bridge

Construction.

3. International Society of Arboriculture, (ISA).
    a. Trees and Building Sites.
    b. Tree-Pruning Guidelines.

1.3 QUALITY ASSURANCE

A. Professional Arborist Qualifications:
    1. Engage an accredited professional arborist, acceptable to ENGINEER, skilled, trained and with successful and documented experience in the protection and restorative care of trees, certified by the International Society of Arboriculture or American Society of Consulting Arborists; who agrees to employ only tradesmen with specific skill and successful experience in this type of Work.
    2. Submit names and qualifications to ENGINEER along with the following information on a minimum of three successful projects.
        a. Names and telephone numbers of owner, architects or engineers responsible for projects.
        b. Approximate contract cost of the tree protection and trimming.
        c. Amount and kinds of tree protection and trimming performed.

B. Tree Pruning Standards: Comply with ANSI A300 and ISA standards, unless more stringent requirements are specified, or required by Site conditions.

C. Pre-installation Conference:
    1. Prior to commencement of Site construction Work, CONTRACTOR shall schedule and meet at the Site with professional arborist, installers of other Site construction Work in and around areas of existing plantings to remain, the ENGINEER and other representatives directly concerned with performance of the Work. Review foreseeable methods and procedures related to protection of existing plantings to remain, including the following:
        a. Review Project requirements and the Contract Documents.
        b. Review required submittals, both completed and yet to be completed.
        c. Review availability of materials and methods of delivery.
        d. Review location and types of below-grade work, required access during construction and methods of protection existing plantings.
        e. Review Project Schedule and availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.
        f. Review environmental conditions, other Project conditions, and procedures for coping with unfavorable conditions.
        g. Review procedures needed for protection of plantings during the remainder of the construction period.
        h. Review required inspection, testing, and certifying procedures.
    2. Record the discussions of the conference and the decisions and agreements or disagreements reached, and furnish a copy of the record to each party attending.
    3. Record all revisions or changes agreed upon, reasons therefor, and parties agreeing or disagreeing with them.
    4. Reconvene the meeting at the earliest opportunity if additional information

must be developed in order to conclude the subjects under consideration.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data:
      a. Submit product data for each material specified.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Certification by professional arborist that trees shown to remain were protected during the course of construction in accordance with recognized standards of the industry, as specified.
      b. Certification that where damage did occur, trees were promptly and properly treated, or replaced.
   2. Qualifications Data:
      a. Professional arborist.

C. Closeout Submittals: Submit the following:
   1. Care and Maintenance Data:
      a. Submit typewritten instructions recommending procedures to be established by OWNER for seasonal care and maintenance of trees affected by construction activities, after Substantial Completion.

1.5 PROJECT CONDITIONS

A. Protection and Precautions:
   1. Protect existing trees to remain during the course of construction in accordance with recognized standards of the industry, as specified.
   2. Where damage occurs, professional arborist shall promptly and properly treat trees in accordance with recognized standards, as specified.
   3. Replace damaged trees, as specified, at no additional cost to the OWNER where, in the opinion of the professional arborist or ENGINEER, damaged trees are incapable of retaining full growth potential, or have been damaged to the extent that they can no longer perform their intended function in the landscape.

1.6 EXTENDED SERVICE

A. Extended Landscape Service for Tree Repair and Replacement and Trees Affected by Grade Lowering:
   1. Begin extended service immediately after area regraded. Provide extended service for 90 days after tree plantings are acceptably completed and grade modifications performed.
   2. Prune, cultivate, water, weed, fertilize, shade, mist, restore planting saucers, tighten and repair stakes and guy supports, and reset tree plantings to proper grades or vertical position, as required to establish healthy, viable plantings.
      a. Do not allow trees to wilt or show other signs of environmental stress.

Visit the Site twice a week during the extended service periods, to inspect the condition of the plantings and immediately provide required care.

b. CONTRACTOR shall provide landscape installer who shall be available on-call if notified between regular visits that plants require critical care or maintenance, throughout the time of extended service period.

3. Check and observe tree plantings for signs of insect and disease attack. Take corrective measures immediately upon notice of such attack. Control damaging insects and diseases, as specified.
4. Restore or replace damaged tree wrappings.
5. Remove dead trees immediately. Replace immediately unless required to plant in the succeeding planting season.

B. Provide sufficient water to ensure that tree root zone remains moist at all times.
   1. Apply water using a 1-inch diameter hose with an attached metering gauge.
   2. Apply water at a sufficiently slow rate to prevent water run-off from the soil surface but great enough to provide 0.2-inches of water per square foot of canopy area per hour for five hours each week.

C. Any decline in the condition of trees shall require CONTRACTOR to take immediate action to identify potential problems and undertake corrective measures. If required, engage professional arborist or horticulturist to inspect trees, identify problems and recommend corrective procedures. Advise ENGINEER of all such actions and submit inspection and recommendation reports.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D 448, Size 24, with 90 to 100 percent passing a 2-1/2-inch sieve and not more than ten percent passing a 3/4-inch sieve.

B. Topsoil: Provide topsoil, as required, that is fertile, friable, natural loam, surface soil, capable of sustaining vigorous plant growth, free of any admixture of subsoil, clods of hard earth, plants or roots, sticks or other extraneous material harmful to the growth of plants. Obtain topsoil only from well-drained sites where soil occurs in depth of 4-inches or more; do not obtain from bogs or marshes. Supply topsoil with the following analysis:
   1. 3/4-inch Mesh: 100 percent passing.
   2. No. 4 Sieve: 90 to 100 percent passing.
   3. No. 200 Sieve: 0 to 10 percent passing.
   4. Clay content of material passing No. 200 sieve not greater than 60 percent, as determined by hydrometer tests.
   5. pH 5.0 to pH 6.5. If approved by ENGINEER, natural topsoil not having the hydrogen-ion value specified may be amended by CONTRACTOR at his own expense.
   6. Organic content not less than five percent, as determined by ignition loss.

7. Free of pests or pest larvae.

C. Drain Tile: Provide 4-inch standard strength, perforated bell-and- spigot clay pipe, in compliance with ASTM C 700.

D. Filter Fabric: Manufacturer's standard, nonwoven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.

E. Stone: Naturally occurring at the Site, as selected by CONTRACTOR.

F. Burlap: Jute not less than 7.2 ounces per square yard.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:
1. Install temporary fencing, barricades or guards, located as recommended by professional arborist, outside the drip line of trees.
2. Protect tree root systems from damage caused by noxious materials from run-off or spillage during mixing, placing, or storing of construction materials. Protect root systems from flooding, erosion or excessive wetting resulting from dewatering operations or other construction activities.
3. Do not allow fires under or adjacent to trees or other plants to remain.
4. Do not store materials, debris, topsoil or excavated subsoil within the drip line of trees to remain. Do not permit vehicles within drip line. Restrict foot, vehicle and equipment traffic to prevent compaction of soil over root systems. Where such activities are unavoidable, and only as acceptable to ENGINEER, provide continuous heavy wood planking, effectively fastened together and capable of distributing all loads from such activities, above a filter fabric layer covered with 2-inches of gravel.
5. Cut branches and roots, if required, with sharp pruning instruments; do not break or chop. Paint cuts over 1/2-inch in size with tree wound dressing.

B. Excavation:
1. Excavate within drip line of trees only where shown.
2. Where trenching for utilities is required within drip line, tunnel under or around main lateral feeder roots by drilling, auger boring, pipe jacking, or digging by hand under supervision of professional arborist. Do not cut main lateral roots or tap roots; cut smaller roots, which interfere with installation of the Work.
3. Where excavation for construction is required within drip line of trees, hand excavate to minimize damage to root systems. Perform excavation under supervision of professional arborist. Install shoring or other protective support systems at excavations, to minimize sloping or benching of excavations. Use narrow tine spading forks and comb soil to expose roots.
4. Relocate roots in backfill areas wherever possible. If large, main lateral roots are encountered, expose beyond excavation limits as required to bend and

relocate without breaking. If encountered immediately adjacent to location of construction and relocation is not practical, cut roots approximately 3-inches back from construction.

5. Do not allow exposed roots to dry out before permanent backfill is placed; provide temporary earth cover. Water and maintain in moist condition and temporarily support and protect from damage until permanently relocated and covered with earth.

C. Regrading:
   1. Maintain existing grade within drip line of trees, unless otherwise shown or specified.
   2. Grade Lowering:
      a. Where new finish grade is shown below existing grade around trees, slope grade beyond drip line. Maintain existing grade within the drip line of trees.
      b. Prune tree roots exposed during grade lowering, or provide permanent protections as recommended by professional arborist. Do not cut main or lateral roots or taproots; cut only smaller roots.
      c. Compensate for loss of roots and prune branches to stimulate root growth.
      d. Provide extended service during the Contract period as recommended by professional arborist.
   3. Minor Fills:
      a. Where existing grade is 6-inches or less below elevation of finish grade shown, fill with topsoil.
      b. Place in single layer and do not compact.
      c. Hand grade to required finish elevations.
   4. Moderate Fills:
      a. Where existing grade is more than 6-inches, but less than 12-inches, below finish grade elevation, place a layer of drainage fill and filter fabric on existing grade prior to placing topsoil.
      b. Carefully place drainage fill against tree trunk approximately 2-inches above elevation of finish grade and extend not less than 18-inches from tree trunk on all sides.
      c. Place filter fabric with edges overlapping 6-inches, minimum.
      d. Place fill layer of topsoil to finish grade elevation.
      e. Do not compact stone, gravel or topsoil layers; hand grade to required finish elevations.
   5. Deep Fills:
      a. Provide an open dry circular well of durable stone, without mortar, situated at least 24-inches from the tree trunk.
      b. To facilitate proper drainage, place eight to ten continuous runs of 4-inch drain tiles horizontally on the original grade under the complete spread of the branches in a radial pattern around the tree.
      c. Slope drains away from tree.
      d. Place drainage fill on the ground for a depth of 2-inches under and 6-inches over the drain tile.
      e. Place filter fabric over drainage fill.

f. Place eight to ten 4-inch drain tiles vertically in a radial pattern around the tree at a distance of five feet from the tree. Extend vertical drain tiles from the filter fabric layer above the horizontal drain to finished grade
g. Hold drains in place with fill.
h. Hand grade to required elevation.

D. Tree Pruning:
1. Remove branches from trees to remain only with the approval of ENGINEER, and only as required to clear permanent construction, using branch removal methods in compliance with specified standards.
2. Extend pruning operation to restore natural shape of entire tree where pruning is approved by ENGINEER.
3. Prune branches to balance loss to root system caused by damage or cutting of root system.
4. Chip branches removed from trees. Stockpile and spread chips as directed by the ENGINEER.

E. Tree Repair and Replacement:
1. Cavity Repair:
a. Remove decayed areas to depth, which exposes healthy tissue.
b. Shape cavities to provide drainage.
c. Paint inside of cavity with accepted antiseptic tree wound paint.
d. Do not fill cavities.
e. When cavity cross section exceeds 60 percent of cross section of tree, remove tree upon authorization of ENGINEER.
f. Remove tree stumps to 12-inches below finished grade.
2. Promptly repair trees damaged by construction operations within 24 hours of the occurrence of such damage. Treat damaged trunks, limbs, and roots according to written instructions of professional arborist.
3. Remove and replace dead trees, and damaged trees determined by professional arborist to be incapable of restoration to normal growth pattern.
4. If trees over 6-inches in caliper measurement, taken 12-inches above grade, are required to be replaced, provide new trees of 6-inch caliper size, and of the species selected by ENGINEER.

3.2 CLEAN-UP

A. Burning of removed trees, chips and branches is not permitted on the Site.

B. Remove excess excavated material, displaced trees, excess chips and trimmings. Legally dispose off-Site.

C. Remove protection barriers and load distributing layers when no longer needed and restore areas beneath trees.

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SECTION 32 12 00

FLEXIBLE PAVING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install flexible, hot-mix, hot-laid, asphalt concrete pavement.
   2. The Work includes:
      a. Preparation such as sawcutting, milling where shown or indicated, cleaning, and other preparation for installing flexible pavements.
      b. Providing asphalt concrete paving materials.
      c. Providing tack coat material.
      d. Providing pavement markings where shown or indicated.
      e. Providing quality controls and testing.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before flexible paving Work.

C. Related Sections:
   1. Section 31 20 00, Earth Moving.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. AASHTO M320, Specification for Performance-Graded Asphalt Binder.
   2. AASHTO MP1a, Specification for Performance-Graded Asphalt Binder.
   3. AI MS-2, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
   4. ASTM C1371, Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
   5. ASTM C1549, Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
   6. ASTM D242/D242M, Specification for Mineral Filler For Bituminous Paving Mixtures.
   7. ASTM D692/D692M, Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
   8. ASTM D946/D946M, Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
   9. ASTM D977, Specification for Emulsified Asphalt.
   10. ASTM D1073, Specification for Fine Aggregate for Bituminous Paving Mixtures.

11. ASTM D1188, Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples.
12. ASTM D2726, Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
13. ASTM D2950, Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
14. ASTM D3549, Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
15. ASTM D6690, Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
16. ASTM E329, Specification for Agencies Engaged in Construction Inspection and/or Testing.
17. ASTM E408, Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
18. ASTM E1918, Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
19. ASTM E1980, Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
20. FS TT-P-115, Paint, Traffic, Highway, White and Yellow.
21. USGBC LEED-NC, Reference Guide, For New Construction and Major Renovation.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Asphalt Concrete Production Facility:
      a. Production facility for asphalt concrete, tack coat materials, and other bitumastic materials shall be certified by the New York State Department of Transportation for furnishing such materials for New York State highways.
   2. Contractor’s Testing Laboratory:
      a. Retain the services of independent testing laboratory to perform testing and determine compliance with the Contract Documents of the materials provided under this Section.
      b. Testing laboratory shall comply with ASTM E329 and requirements of Section 01 45 29.13, Testing Laboratory Services Furnished by Contractor.
      c. Testing laboratory shall be experienced in the types of testing required.
      d. Selection of testing laboratory is subject to Engineer's acceptance.

B. Regulatory Requirements:
   1. Reference Specifications and Details:
      a. Comply with applicable requirements of New York State Department of Transportation Standard Specifications and Standard Details.
   2. Obtain required highway and street rights-of-way work permits.
   3. Jurisdiction:
      a. Paved areas to be constructed are jurisdiction of the Village of Ossining, New York.

C. Quality Assurance Testing:
   1. Quality assurance testing is in addition to source quality control testing, when required, and field quality control testing required under Article 3.4 of this Section.
   2. Materials used in the Work may require testing and retesting, as directed by Engineer, during the Project. Allow free access to material stockpiles and facilities at all times. Tests not specifically indicated to be performed at Owner's expense, including retesting of rejected materials and installed Work, shall be performed at Contractor's expense.
   3. Contractor's Quality Assurance Testing Laboratory Scope:
      a. Use of testing laboratory shall not relieve Contractor of responsibility for providing materials and the Work in compliance with the Contract Documents.
      b. Quality assurance testing laboratory shall perform the following, unless evidence of material compliance with reference specifications indicated in Paragraph 1.3.B of this Section, is submitted to Engineer by Contractor and asphalt concrete production facility:
         1) Test in accordance with reference specifications indicated in Article 1.3 of this Section. In lieu of quality assurance testing, submit evidence and certification of material compliance with reference specifications. When evidence of conformance submitted is not acceptable to Engineer, perform quality assurance testing.
      c. To facilitate testing services, Contractor shall:
         1) Secure and deliver to testing laboratory and Engineer (when requested by Engineer) representative Samples of materials that Contractor proposes to furnish and that are required to be tested.
         2) Furnish such labor as is necessary to obtain and handle Samples at the Site or at asphalt concrete production facility and other material sources.
         3) Advise testing laboratory and Engineer sufficiently in advance of operations to allow for completion of quality assurance tests and for the assignment of personnel.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Submit the proposed asphalt concrete mix design for each asphalt concrete material, and other bituminous materials, required under this Section, providing complete data on materials, including location in the Work, source, material content and percentages, temperatures and all other pertinent data. Indicate proportion of bituminous material from reclaimed asphalt pavement.
      b. Proposed gradation for each aggregate to be used in flexible paving. Submit gradation test results for the same material furnished on a previous project. Indicate the proportion of reclaimed asphalt pavement.

2. Product Data:
    a. Manufacturer's complete product data on all pavement marking materials proposed for use, including product literature, specifications, and recommended application techniques and other installation data.

B. Informational Submittals: Submit the following:
    1. Quality Assurance Test Data Submittals and Source Quality Control Submittals:
        a. Submit for quality assurance tests and source quality control tests required.
    2. Delivery Tickets:
        a. Submit copy of delivery ticket for each load of asphalt concrete, tack coat materials, and other materials obtained from asphalt concrete production facility, signed by Contractor.
    3. Field Quality Control Submittals:
        a. Submit results of required field quality control testing.
    4. Qualifications:
        a. Asphalt concrete production facility, when required by Engineer.
        b. Contractor's testing laboratory, when required by Engineer.

1.5 SITE CONDITIONS

A. Weather Limitations:
    1. Temperature:
        a. For base course and binder course paving lifts equal to or greater than two inches thickness, atmospheric temperature shall be 40 degrees F and rising.
        b. For surface course paving or other pavement courses in lifts less than two inches thick, temperature of surface on which pavement is to be placed shall be 50 degrees F or greater.
    2. Prohibitions:
        a. Do not place flexible paving materials when weather is foggy or during precipitation.
        b. Do not place flexible paving materials when the base on which the material will be placed contains moisture in excess of optimum.
        c. Place flexible paving materials only when Engineer concurs that weather conditions are suitable.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. System Description:
    1. Provide subbase course of the thickness shown or indicated, in accordance with Section 31 20 00 Earth Moving.

2.2 ASPHALT CONCRETE MIXES

A. Asphalt Concrete Mixtures: Provide the following materials designed and manufactured in accordance with reference specifications indicated in Article 1.3 of this Section:
   1. Binder Course: Asphalt Concrete – Type 3 (NYSDOT) Binder Course, in accordance with NYSDOT specifications.
   2 Surface Course (Wearing Course, Top Course): Asphalt Concrete – Type 7 Top Course, in accordance with NYSDOT specifications.

2.3 BITUMINOUS MATERIALS

A. Bituminous Materials for Asphalt Concrete:
   1. Bituminous materials for asphalt concrete shall comply with the reference specifications indicated in Article 1.3 of this Section, for the asphalt concrete mixes specified.
   2. Bituminous Materials from Reclaimed Asphalt Pavement (RAP): When use of RAP in bituminous materials is acceptable, comply with requirements for RAP in Article 2.4 of this Section.

B. Tack Coat:
   1. Tack coat shall be emulsified asphalt.
   2. Provide Tack Coat, in accordance with reference specifications indicated in Article 1.3 of this Section.

C. Crack Sealant:
   1. Provide Routing, Cleaning and Sealing Cracks in HMA Using Hot Applied Sealant, in accordance with reference specifications indicated in Article 1.3 of this Section.

2.4 AGGREGATES IN FLEXIBLE PAVEMENTS

A. Aggregates for Asphalt Concrete – General:
   1. Aggregate materials used in flexible pavement shall be in accordance with the reference specifications indicated in Article 1.3 of this Section, for the asphalt concrete mix designs indicated.

B. Reclaimed Asphalt Pavement (RAP):
   1. Processed material obtained by milling or full depth removal of existing asphalt concrete pavement may be used as aggregate in asphalt concrete base course and binder course.
   2. Maximum proportion of RAP in the asphalt concrete provided shall comply with requirements of the reference specifications indicated in Article 1.3 of this Section.
   3. When RAP is used, comply with Contract Documents requirements for the applicable asphalt concrete course mix design, bituminous materials, and aggregates.

2.5 PAVEMENT MARKING MATERIALS

A. Material:
   1. Pavement marking paint shall have chlorinated rubber base.
   2. Factory-mixed, quick-drying and non-bleeding, complying with FS TT-P-115, Type III.

B. Colors:
   1. Roadway Center Markings Between Opposing Traffic Lanes: Yellow.
   2. Roadway Side Striping: White, unless otherwise shown or specified. On roads with divided median, right-side striping of each direction shall be white, and left-side striping shall be yellow.
   3. Roadway Miscellaneous Lane Markings (turn lane arrows and text): White.
   4. No-Parking Areas: Yellow.
   5. Handicap Parking Spaces: Unless otherwise indicated with signs, provide handicap symbol on pavement with white paint on blue background.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine the subbase and base on which flexible paving will be installed. Notify Engineer in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

B. Do not place materials on subgrades, or subbase that is muddy or has water thereon.

3.2 PREPARATION

A. Preparation: Before starting installation of flexible paving, perform the following:
   1 Grade Control: Establish and maintain throughout flexible paving installation the required lines and grades, including crown and cross-slope for each asphalt concrete course during construction operations.
   2. Prepare subgrade and provide subbase for flexible pavement in accordance with Section 31 23 16.13, Trenching. Before installing flexible pavement, obtain Engineer's concurrence that subgrade and subbase are suitable for installing flexible pavement.
   3. Coordinate placement of flexible pavement with the Work included under Section 32 16 13, Concrete Curbs, Gutters and Sidewalks, and Work including drainage structures, manholes, valve boxes, and similar items.
   4. Provide appropriate maintenance and protection of traffic measures during placement of pavement.

B. Milling:
   1 Perform milling of existing pavement where shown or indicated.

2. "Milling" consists of the milling, shaping, and removing portions of existing surfaces by cold milling process and subsequent cleaning.
3. Milling Equipment:
    a. Milling machines shall be power-operated, self-propelled machines capable of removing the desired thickness of existing surfaces. Machines shall have sufficient power, traction, and stability to accurately maintain depth of cut and slope. Machines shall produce a finished profile and cross slope to within 1/4 inch of that required and shall produce uniform surface texture free of gouges and ridges greater than 3/8-inch deep.
    b. Machines shall be equipped with a means to control dust and other particulate matter created by the cutting action.
    c. Provide equipment that removes milled material as quickly as the rate of milling.
    d. Use vacuum trucks, street sweepers or power brooms to clean milled surfaces.
4. Milling Operations:
    a. Perform milling to so that, when final course of pavement is placed, required elevations and grades are provided. Where required, establish a taut reference string line to control line and grade of milling.
    b. Minimize the time between milling and placement of pavement over milled surface.
    c. Areas not accessible to the milling machine, such as around or adjacent to drainage structures, manholes, curbs, and transverse joints on structures, may be removed by a small milling machine, handwork or other method acceptable to Engineer.
    d. Remove milled material as soon as it is milled. Remove fines and other material prior to opening milled area to traffic. Control objectionable dust emissions. When traffic has been allowed into milled area or when more than 48 hours have elapsed since milling, clean the milled area again prior to applying tack coat.
    e. Maintain drainage to drainage inlets and other drainage structures in a manner acceptable to Engineer.
    f. Properly dispose of milled material at a location away from the Site.

C. Surface Preparation:
1. Repair surface defects in existing pavement to provide uniform surface to receive new pavement.
2. Provide crack sealant to completely fill cracks more than 1/16-inch wide in areas shown or indicated on the Drawings.
3. Clean existing surfaces over which asphalt concrete pavement will be installed, by removing from the surface foreign material, excess asphalt concrete, excess joint sealant, and crack filler, and other undesirable matter.
4. Provide tack coat as indicated in Article 3.3 of this Section.

3.3 INSTALLATION OF FLEXIBLE PAVING

A. General:

1. Provide final pavement surfaces of uniform texture, at required grades and cross-sections.
2. Construct roadways to the lines, grades, and typical sections shown or indicated.

B. Installation of Asphalt Concrete:
   1. Asphalt concrete mixture shall be transported to the site of paving and placed as soon as possible after mixing.
   2. Placement of each asphalt concrete course shall be completed over the full width of the section under construction during each day's paving operations.
   3. Spread and finish asphalt concrete courses by means of self-propelled mechanical spreading and finishing equipment. Compacted thickness of layers placed shall not exceed 150 percent of specified thickness unless approved in writing by Engineer.
   4. Compaction:
      a. Rollers:
         1) Use sufficient rolling equipment to satisfactorily compact and finish the quantity of asphalt concrete placed. There shall be not less than two rollers on the Project at all times. When acceptable to Engineer, one of the rollers may be a pneumatic-tire roller.
         2) During rolling operations, roller speed shall not exceed three miles per hour. When sufficient number of rollers is not available, reduce the quantity of asphalt concrete placed to accommodate the available rollers' speed.
         3) Required rollers shall be at the Site, in acceptable operating condition, prior to placing of asphalt concrete.
         4) Use of vibratory rollers in lieu of steel-wheeled rollers is acceptable, however when thickness of asphalt concrete is one-inch or less, rolling shall be in the static mode.
      b. Rolling of initially-placed asphalt concrete material, or breakdown rolling, shall begin as soon as the asphalt concrete mixture will bear the roller without undue displacement.
      c. Rolling shall be longitudinal, overlapping on successive trips by not less than one-half roller rear wheel width, and not more than three-quarters of roller rear wheel width. Alternate trips of the roller shall be of slightly different lengths.
      d. At all times, roller motion shall be slow enough to avoid displacing the asphalt concrete.
      e. Operate rollers continuously from breakdown of laid asphalt concrete through finish rolling.
      f. Perform finish rolling using a steel-wheeled roller or a vibratory steel-wheel roller operating in the static mode.
      g. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.
      h. At each location not accessible to roller, thoroughly compact asphalt concrete with tampers and finish, where necessary, with a hot smoothing iron to provide uniform, smooth layer over the entire area so compacted.

5. Each compacted asphalt concrete course shall be within plus or minus 1/4-inch of the indicated thickness.
6. Placement of Adjacent Strips of New Asphalt Concrete:
    a. When more than one width of asphalt concrete material will be placed, a six-inch wide strip of asphalt concrete adjacent to the area on which the future material is to be placed shall not be rolled until such future material is placed.
    b. Do not leave the unrolled strip unrolled for more than two hours after placement, unless the six-inch unrolled strip is first heated with a joint heater.
    c. After the first strip or width of asphalt concrete is compacted, place, finish, and compact the second width or strip as required for the first width, except that rolling shall be extended to include the six-inch strip of the first width not previously compacted.

C. Construction Joints:
1. Construction joints shall be made in such a manner as to ensure a neat junction, thorough compaction, and bond throughout.
2. Provide a transverse joint extending over the full width of the strip being laid and at right angles to its centerline at end of each workday and at other times when the placement of hot-mix asphalt concrete will be suspended for a period of time that will allow asphalt concrete mixture to chill.
3. Thoroughly compact by rolling the forward end of a freshly laid strip of asphalt concrete before the asphalt concrete mixture becomes chilled. When the Work is resumed, the end shall be cut vertically for the full depth of the layer.

D. Joining of Pavements:
1. When pavement is to join existing or previously-laid pavement, the existing or previously-laid pavement shall be neatly and carefully edged to allow for overlapping and feathering of the subsequent course of asphalt concrete material.
2. Where new pavement is to meet existing pavement, the existing pavement shall be sawcut and notched.
3. Where new pavement will meet existing asphalt pavement, remove existing pavement 12 inches onto undisturbed existing pavement course at edges where new pavement will meet existing pavement.
4. Tack Coat:
    a. Provide tack coat material at the following locations:
        1) At edges where new pavement will connect to existing or previously-installed pavement.
        2) On surface of existing or previously-installed pavement course over which new pavement will be installed, prior to placement of the subsequent pavement course. Tack coat may be deleted when a succeeding layer of asphalt pavement is being applied over a freshly-placed asphalt pavement course that has been subjected to very little or no traffic, with approval of Engineer.

3) Where new pavement will abut curbing, concrete gutters, drainage structures and frames, manhole cover frames, valve boxes, and similar items.

b. Tack Coat Installation: Install tack coat immediately prior to installing pavement. Place pavement while tack coat is wet. Apply tack coat in accordance with reference specification indicated in Article 1.3 of this Section.

E. Curing:
1. Do not allow traffic onto pavement until directed by Engineer. Traffic will not be allowed on new asphalt concrete pavement until surface temperature is less than 140 degrees F.
2. Hold construction traffic on new pavement to a minimum as acceptable to Engineer.

F. Asphalt Concrete Curbs: Provide extruded asphalt curbs of the height and profile indicated on the Drawings.

G. Defective Pavement Work:
1. When directed by Engineer, remove and replace defective flexible paving Work. Cut out such areas of defective pavement and fill with fresh asphalt concrete materials, compacted to required density.

3.4 FIELD QUALITY CONTROL

A. Site Tests:
1. Responsibility:
a. Contractor's field quality control testing laboratory will:
1) Perform field density tests to verify that required compaction of asphalt materials has been obtained.
2) Test the proposed materials for compliance with the Contract Documents, as directed by Engineer.
3) Submit reports of all test results to Engineer and Contractor.
b. Authority Field Quality Control Testing Laboratory:
1) Technicians representing the testing laboratory will inspect materials at the Site and perform required testing. When the materials furnished or Work performed do not comply with the Contract Documents, field quality control testing laboratory technician shall direct the attention of Engineer and Contractor to such non-compliance.
2) Testing laboratory personnel shall not act as foreman or perform other duties for Contractor. The Work will be checked as it progresses, but failure to detect defective Work shall not in any way prevent the later rejection of such defective Work when defect is discovered. Failure to detect defective Work as it occurs does not obligate Engineer to final acceptance. Testing laboratory personnel are not authorized to revoke, alter, relax, enlarge, or release

requirements of the Contract Documents, nor to approve or accept any portion of the Work.

2. Asphalt Concrete Mix Temperature: Measure temperature at time of placement, record, and submit to Engineer.
3. Surface Smoothness:
   a. Test finished surface of each flexible paving course for smoothness, using a ten-foot straightedge applied parallel to and at right angles to centerline of paved areas.
   b. Check surfaced areas at intervals as directed by Engineer.
   c. Surfaces will be acceptable relative to smoothness when measurements are equal to or less than the following:
      1) Base Course: 3/8-inch vertical in ten feet horizontal.
      2) Binder Course: 3/8-inch vertical in ten feet horizontal.
      3) Surface Course (Wearing Course): 1/4-inch vertical in ten feet horizontal.
   d. Elevation: Finished surface of pavement shall be within plus or minus 1/2-inch of elevations shown or indicated.
4. Density:
   a. Test Method: ASTM D2950 nuclear method; test one sample every 1,000 square yards of pavement. Test for each asphalt concrete course installed.
   b. In addition, when directed by Engineer, compare density of in-place flexible paving materials against laboratory specimen or certificates on same asphalt pavement mixture, using nuclear density device.
   c. Criteria for Acceptance: Density of in-place asphalt pavement material shall be not less than 90 percent of the recorded laboratory specimen or certificate density. Density shall be not greater than 98 percent.
5. Repair holes from test specimens in accordance with this Section's requirements for repairing defective Work.

3.5 ADJUSTING

A. Frames and Covers:
   1. Set frames of drainage structures, manholes, valve boxes, and similar items to final grade. Adjust frames of existing structures and frames furnished under other Sections. Frames shall be substantially similar elevation to finished surface course of pavement.
   2. Replace covers and gratings of existing structures immediately following adjusting associated frames. Install covers and gratings of structures provided under the Project as quickly as possible.
   3. Where there is a delay between adjusting of frames and installation of surface course, provide temporary bituminous material around perimeter of each frame to smooth vehicle access over the frame. Maintain and repair temporary bituminous material as required until placement of surface course. Remove temporary bituminous material before installing surface course.

B. Pavement Adjustment:
   1. Repair or replace in manner acceptable to Engineer areas of pavement that are observed to pond or collect water.

3.6 CLEANING

A. Cleaning: After completing the paving operations, clean surfaces of excess or spilled bituminous materials, excess asphalt concrete, and foreign matter.

3.7 PROTECTION

A. Protect finished pavement until pavement has become properly hardened and cool.

B. Cover openings of drainage structures, manholes, valve boxes, and similar items in the paved area until permanent coverings are provided.

3.8 PAVEMENT MARKINGS

A. Pavement Markings: Provide pavement markings where shown or indicated.
   1. Preparation:
      a. Sweep surface with power broom supplemented by hand brooms to remove loose material and dirt.
      b. Do not begin marking bituminous concrete pavement until approved by Engineer.
      c. When reflective glass beads are required, mix with paint prior to paint application.
   2. Application:
      a. Using mechanical equipment, provide uniform, straight edges in two separate coats. Apply in accordance with paint manufacturer's recommendations.

+ + END OF SECTION + +

SECTION 32 31 00

FENCING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified, and required to furnish and install fencing.
   2. Extent of fencing is shown or indicated.
   3. Types of materials required under this Section include:
      a. Aluminum-coated, steel chain link fabric.
      b. Galvanized steel framework.
      c. Polyvinylchloride fusion-bonded finish.
      d. Barbed wire.
      e. Auxiliary system components, gates, accessories, fasteners, and fittings.
   4. Substitutions: Structural shapes of satisfactory sections and equal strengths may be substituted upon Engineer's approval of Contractor's substitution request.

B. Related Sections:
   1. Section 03 00 05, Concrete.
   2. Section 03 60 00, Grouting.
   3. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   2. ASTM A90/A90M, Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
   3. ASTM A123, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   4. ASTM A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   5. ASTM A428/A428M, Test Method for Weight [Mass] of Coating on Aluminum-Coated Iron or Steel Articles.
   6. ASTM A491, Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
   7. ASTM A780, Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
   8. ASTM A817, Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric.

9. ASTM A1011/A1011M, Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
10. ASTM B6, Specification for Zinc.
11. ASTM D412, Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension.
12. ASTM D746, Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
13. ASTM D792, Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
14. ASTM D1499, Practice for Filtered Open-Flame Carbon-Arc Exposures of Plastics.
15. ASTM D2240, Test Method for Rubber Property—Durometer Hardness.
16. ASTM F552, Terminology Relating to Chain Link Fencing.
17. ASTM F567, Practice for Installation of Chain-Link Fence.
18. ASTM F626, Specification for Fence Fittings.
19. ASTM A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
20. ASTM F668, Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric.
21. ASTM F900, Specification for Industrial and Commercial Swing Gates.
22. ASTM F1043, Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
23. ASTM F1083, Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
24. ASTM F1184, Specification for Industrial and Commercial Horizontal Slide Gates.
25. ASTM F1664, Specification for Poly(Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Tension Wire Used with Chain-Link Fence.
26. ASTM F1665, Specification for Poly(Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used With Chain-Link Fence.
27. CLFMI CLF 2445, Product Manual.
28. CLFMI, Step-by-Step Installation Guide.
29. IEEE C2, National Electrical Safety Code.
30. IEEE 81, Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System Part 1: Normal Measurements.
31. NEMA ICS 1, Industrial Control and Systems General Requirements.
32. NEMA ICS 2, Industrial Control and Systems: Controllers, Contactors and Overload Relays Rated 600 Volts.
33. NEMA ICS 6, Industrial Control and Systems Enclosures.
34. NEMA MG 1, Motors and Generators.
35. UL 467, Grounding and Bonding Equipment.

1.3 TERMINOLOGY

A. The following words or terms are not defined but, when used in this Section, have the following meaning.
   1. "Knuckling" describes the type of selvage obtained by interlocking adjacent pairs of wire ends and then bending the wire ends back into a closed loop.
   2. "Fencing" describes an assembly of metal components, including wire chain-link fabric fastened to top, bottom and intermediate horizontal rails and to vertical line posts, corner posts and terminal posts. This assembly includes all auxiliary components, gates, fittings, fasteners, and other accessories, all with specified protective coatings.

B. Terminology used in this Section and not defined in this Article will be construed in accordance with the terminology used in CLF 2445 and ASTM F552.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Erector/Installer:
      a. Engage a single erector that is skilled and trained, and possesses successful and documented experience installing fencing, and employs only workers with specific skill and successful experience in the type of Work required.
      b. Erector shall be acceptable to fencing manufacturer,
      c. Submit name and qualifications of erector with the following information for a minimum of three successful projects:
         1) Names and telephone numbers of owner and architect or engineer responsible for project.
         2) Approximate fencing contract amount.
         3) Quantity of fencing installed.

B. Component Supply and Compatibility:
   1. Provide fencing as complete system with all gates, hardware, appurtenances and other components produced by a single manufacturer, including custom erection accessories, fittings, clamps, and fastenings as required for complete system.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings at scale of 1/4-inch equal to one foot of typical fence assembly, identifying all materials, dimensions, sizes, weights, and finishes of rails, posts, braces, supports and other fencing components. Show fence heights, and locations of gates. Show gate swing, or other operation, hardware, and accessories. Include plans, elevations, and sections, with required installation and operating clearances, and details of post anchorage, attachments, and bracing.

b. Large-scale details drawn at scale of three inches equal to one foot for all connections and gate details.
c. List of all hardware, fasteners, and accessories.

2. Product Data:
   a. Copies of manufacturer's technical product information, and specifications for all fencing components.
   b. Data substantiating that materials proposed comply with the following:
      1) Physical properties of PVC protective coating, in compliance with ASTM D1499.
      2) Weight of aluminum coating on wire fabrications, in compliance with ASTM A428.
      3) Weight of zinc coating on pipe fabrications, in compliance with ASTM A90.

B. Informational Submittals: Submit the following:
   1. Certifications:
      a. Submit shipping list for materials used, endorsed with manufacturer's voucher, signed by authorized employee of manufacturer, certifying that material used in fencing complies with the Contract Documents and with the approved submittals.
   2. Design Data: Submit with the Shop Drawings:
      a. All structural calculations verifying that all system components comply with requirements of authorities having jurisdiction at the Site.
      b. When proposing fencing framework or other structural components that varies from the Contract Documents, submit fabricator's structural calculations for design of proposed fencing. Structural analysis shall verify that all system components including supports, gates, fasteners, fittings, and connections comply with the Contract Documents and requirements of authorities having jurisdiction at the Site.
   3. Manufacturer's Instructions:
      a. Manufacturer's installation instructions.
   4. Qualifications Statements:
      a. Erector.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:
   1. Packaging and Marking: Comply with CLFMI CLF 2445.
   2. Deliver materials in manufacturer's original, unopened packaging with all factory-applied tags, labels and other identifying information intact, legible and accurately representing material on approved submittals.

B. Storage of Materials:
   1. Store all materials under weatherproof cover, off the ground and away from other construction activities.

2. Do not store material in a manner that would create a humidity chamber. Provide for free movement of air under protective cover and between components of the fencing.

C. Handling of Materials:
   1. Handle material in manner that is in compliance with manufacturer's recommendations and that avoids damaging coatings.

1.7 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities unless allowed:
   1. in Section 01 14 16, Coordination with Owner's Operations; or
   2. under the following conditions, only after providing temporary utility services according to requirements indicated.
      a. Notify ENGINEER and OWNER not less than 30 days in advance of proposed utility interruptions.
      b. Do not proceed with utility interruptions without ENGINEER's written permission.

A. Obtain measurements at the Site to verify layout information and dimensions for fencing and gates in relation to reference points provided by Owner or indicated in the Contract Documents.

1.8 WARRANTY

A. General Warranty: The special warranties specified in this Article shall not deprive OWNER of other rights or remedies OWNER may otherwise have under the Contract Documents and shall be in addition to and run concurrent with other warranties made by CONTRACTOR under the Contract Documents.

B. Special Warranties:
   1. Submit manufacturer's written ten-year warranty against cracking and peeling of PVC coating, and against rusting or corrosion of metal.

PART 2 – PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design Considerations:
   1. Verify size of framing members shown or indicated in the Contract Documents. Where structural analysis indicates the need, provide additional members, or increased member size, thickness or weight.
   2. Modifications may be made only as necessary to meet Site conditions to ensure proper fitting and support of the Work and only upon submittal of Shop Drawings and receipt of approval by Engineer.

2.2 MATERIALS

A. General:
   1. Tube sizes specified are nominal outside dimension.
   2. Roll-formed section sizes are nominal outside dimensions.
   3. Wire gages shall conform to American Steel and Wire Company gage.
   4. Heat-form arcs and chords before applying protective coatings to metal.
   5. Sizes specified are given for uncoated metal. Protective coatings are in addition to specified metal dimensions, gages, and sizes.
   6. Provide weights of zinc and aluminum coatings on wire and pipe fabrications in accordance with CLFMI CLF 2445.
   7. Provide thickness of PVC coating on wire and pipe fabrications in accordance with CLFMI CLF 2445.

B. Chain-Link Fence Fabric:
   1. One-piece fabric widths, for fencing 12 feet and less in height, complying with CLFMI CLF 2445.
   2. Wire mesh shall be woven throughout in form of approximately-uniform square mesh with parallel sides and horizontal and vertical diagonals of approximately-uniform dimensions, of size and gage specified and in compliance with ASTM A817, Type 1, cold-drawn carbon steel wire with minimum breaking strength of 2,170 pounds and coated with aluminized finish, as specified. Fabric shall be as recommended by CLFMI for heavy industrial usage.
   3. Provide fence fabric imprinted with manufacturer's trade name, country of origin, core wire gage, and finished outside diameter gage.
   4. Provide fabric knuckled to eliminate exposure of sharp edges.
   5. Fabric Gage: Provide the following:
      a. No. 9-gage wires.
   6. Mesh Size: Provide the following:
      a. One-inch mesh.

2.3 FRAMEWORK

A. General: The following table presents actual OD and equivalent nominal NPS size and trade size of round members:

Actual OD (inches)	NPS Size (inches)	Trade Size (inches)
1.315	1.0	1-3/8
1.660	1.25	1-5/8
1.900	1.5	2
2.375	2.0	2.5
2.875	2.5	3
3.500	3.0	3.5
4.000	3.5	4
6.625	6.0	6-5/8
8.625	8.0	8-5/8

B. Pipe shall be commercial grade, plain-end steel pipe with standard-weight walls. Steel strip used for manufacture of pipe shall comply with ASTM F1083, Schedule 40 pipe with minimum yield strength of 30,000 psi and protected with zinc, as specified. All finished surfaces of framework pipe or tube shall be coated in black color using the tube or pipe manufacturer's recommended coating system.

C. Fittings: Comply with ASTM F626.

D. End, Corner, and Pull Posts: Provide end, corner, and pull posts of following minimum sizes:
   1. Over six feet fabric height up to eight feet fabric height:
      a. 2.875 inches OD pipe weighing 5.79 pounds per linear foot.

E. Line Posts: Provide line posts of following minimum sizes and weights:
   1. Over six feet fabric height and up to eight feet fabric height:
      a. 2.375 inches OD pipe weighing 3.65 pounds per linear foot.

F. Gate Posts: Provide gate posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
   1. Over 18 feet wide:
      a. 8.625 inches OD pipe weighing 28.55 pounds per linear foot.

G. Top and Bottom Rails: Provide top and bottom rails, unless otherwise shown or indicated, conforming to the following:
   1. 2 inch OD pipe weighing 2.72 pounds per linear foot.
   2. Provide in manufacturer's longest lengths, with expansion-type coupling 0.051-inch thick rail sleeves, approximately seven inches long, for each joint.
   3. Provide means for attaching top rail securely to each gate, corner, pull, and end post.

H. Center Rails Between Line Posts: Provide center rails between line posts consisting of 2-inch OD pipe weighing 2.27 pounds per linear foot.

I. Roll-Formed Steel: Provide rolled steel shapes produced from structural-quality steel conforming to ASTM A1011, Grade 45, with minimum yield strength of 45,000 pounds psi. Protective coating system shall conform to ASTM F1043, as specified.

2.4 GATES

A. Sliding gates shall comply with ASTM F1184.

B. Padlocks: Provide each gate with heavy-duty bronze padlock and shackle chain as follows:
   1. Product and Manufacturer: Provide one of the following:
      a. No. 160DHM with 11/32-inch marine brass shackle by Master Lock Company.
      b. Or equal.

2. Provide three keys for each padlock. Where more than one gate is required for same enclosure, padlocks shall be keyed identically.

C. Provide gate frames with intermediate horizontal rails. Gate frames shall be welded construction and shall be galvanized after fabrication. Provide single gates six feet or greater in width, and double gates 12 feet or greater in width, with diagonal bracing in one direction, extending from top to bottom rail.

D. Gate Stops: Provide gate stops for double gates consisting of mushroom-type flush plate with anchors, set in concrete and designed to engage a center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch, using one padlock for locking both gate leaves.

E. Fabricate gate perimeter frames of tubular members. Provide additional horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware, and accessories. Space so that frame members are not more than eight feet apart. Fabricate as follows:
   1. Over six feet high, or leaf width exceeding eight feet:
      a. 1.900-inch OD pipe weighing 2.72 pounds per linear foot.

F. Assemble gate frames by welding or with special malleable or pressed steel fittings and rivets for rigid connections. Use same fabric as provided for fence. Install fabric with stretcher bars at vertical edges. Bars may also be used at top and bottom edges. Attach stretchers to gate frame at not more than 15 inches on centers. Attach hardware with rivets or by other means that will provide security against removal and breakage.

G. Install diagonal cross-bracing on gates consisting of 1/2-inch diameter adjustable length truss rods provided with turnbuckles to ensure frame rigidity without sag or twist.

H. Where barbed wire is shown or indicated above gates, extend end-members of gate frames one foot above top member and prepare to receive three strands of wire. Provide necessary clips for securing wire to extensions.

I. Sliding Gates: Provide manufacturer's heavy-duty track, ball-bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, and accessories as required.

2.5 AUXILIARY FENCING MATERIALS AND ACCESSORIES

A. Wire Ties:
   1. For tying fabric to line posts, use nine-gage, aluminum alloy 1100-H4, PVC-coated wire ties to match fence fabric, spaced 12 inches on centers.
   2. For tying fabric to rails and braces, use nine-gage, aluminum alloy 1100-H4, PVC-coated wire ties to match fence fabric, spaced two feet on centers.
   3. For tying fabric to tension wire, use 11-gage, aluminum alloy 1100-H4, PVC-coated wire hog ring ties to match fence fabric, spaced two feet on centers.

C. Barbed Wire Supporting Arms: Pressed steel for three rows of barbed wire attached to each arm, complete with provisions for anchorage to posts. Supporting arms shall be integral with post-top weather cap. Provide following type:
   1. Single 45-degree arm, one for each post.

D. Barbed Wire: Commercial quality steel, two-strand, 11-gage line wire with 14-gage, four-point twisted aluminum alloy barbs spaced five inches on centers, as follows:
   1. PVC-coated, complying with ASTM F1665.

E. Post Caps: Pressed steel, wrought iron, or cast aluminum alloy, designed as weather-tight closure cap, for tubular posts. Provide one cap for each post unless equal protection is afforded by combination post-top cap and barbed wire supporting arm, where barbed wire is required.
   1. Provide caps with openings to allow through-passage of top rail.
   2. Provide cone-type caps for terminal posts and loop-type caps for line posts.

F. Stretcher Bars: One-piece lengths equal to full height of fabric, with minimum cross-section of 3/16-inch by 3/4-inch. Provide one stretcher bar for each gate and end-post, and two for each corner- and pull-post, except where fabric is integrally woven into the post.

G. Stretcher Bar Bands: Pressed steel, galvanized, 0.078-inch to 0.108-inch thick depending on post diameter, spaced not greater than 15 inches on centers to secure stretcher bars to end-, corner-, pull-, and gate-posts.
   1. Bands may also be used with special fittings for securing rails to end-, corner-, pull-, and gate-posts.

H. Truss Rods: Steel rods, 3/8-inch diameter, merchant quality with turnbuckle.

I. Concrete: In accordance with Section 03 00 05, Concrete.

2.6 FINISHING

A. Chain-Link Fence Fabric:
   1. Aluminized finish with not less than 0.40 ounces aluminum per square foot, complying with ASTM A491, Class II.

B. Framework and Appurtenances: Provide the following finishes for steel framework, auxiliary system components, and miscellaneous accessories:
   1. Galvanizing: Zinc for galvanizing shall be of High Grade or Special High Grade conforming to ASTM B6 with maximum aluminum content of 0.01 percent. Galvanize metal using hot-dip process in accordance with the following:
      a. Structural Iron and Steel Shapes: ASTM A123
      b. Rolled-Form Sheet Steel: ASTM A653
      c. Hardware and Accessories: ASTM A153

d. Fittings: ASTM F626
e. Pipe: ASTM A53

2. Provide minimum weights of zinc as follows:
   a. Pipe: 1.8-ounces of zinc per square foot. Apply Type A coating both inside and outside according to ASTM F1043, as determined by ASTM A90.
   b. Rolled-Form Sheet Steel: 4.0-ounces of zinc per square foot of surface area.
   c. Hardware and Accessories: Zinc weights in compliance with Table 1 of ASTM A153.

C. PVC Finish for All Fencing Components: Provide PVC epoxy-modified plastic resin finish, fusion bonded to heated metal, minimum 10-mil thickness.
   1. Provide the following physical properties for PVC coating:
      a. Specific Gravity, ASTM D792: 1.30 to 1.38, maximum.
      b. Ultimate Tensile Strength, ASTM D412: 2,600 pounds per square inch plus-or-minus five percent.
      c. Hardness, ASTM D2240: Durometer A (10 Second) 93 plus-or minus three.
      d. Ultimate Elongation, ASTM D412: 275 percent plus-or-minus five percent.
      e. Compression Cut Resistance, Bell Laboratories: 2,000 pounds per square inch.
      f. Low Temperature Brittleness, ASTM D746: -20 degrees C.
      g. Low Temperature Flexibility, (Mandrel Wrap): -40 degrees C.
      h. Weatherometer Exposure: No change after 1,000 hours.
   2. Provide PVC plastic resin finish over aluminized steel wire by thermal extrusion method, in compliance with ASTM F668, Class 2b.
   3. Color:
      a. Provide black PVC finish.
      b. Provide fencing with all components, including framework and accessories completely protected with color coating, in compliance with CLFMI CLF 2445.

D. Welded Joints:
   1. Repair zinc coatings at welded joints by applying zinc-rich paint, as specified in Section 09 91 00, Painting, and ASTM A780.
   2. Repair polymer-coated steel by applying an epoxy primer, intermediate coat and urethane topcoat, as specified in Section 09 91 00, Painting, matching color and reflectivity of adjacent PVC finish.

2.7 SOURCE QUALITY CONTROL

A. Fabrication Tolerances:
   1. Fabric, posts, rails, and other supports shall be straight or uniformly curved to provide the profiles shown, to dimensional tolerance of 1/16-inch in 10 feet without warp or rack in the finished Work.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work will be erected and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 ERECTION

A. Comply with CLFMI Step-by-Step Installation Guide and ASTM F567.

B. Excavation: Drill holes of diameters specified, for post footings in firm, undisturbed or compacted soil.
   1. For posts set in cast-in-place concrete, provide hole diameters dug or drilled a minimum of four times the largest cross section of post.
      a. Unless otherwise shown or indicated, excavate hole depths approximately three inches lower than bottom of post, with bottom of posts set not less than two feet below the surface of finished grade when in firm, undisturbed soil, plus an additional three inches for each foot increase in the fence height over four feet.
   2. Spread soil from excavations uniformly adjacent to fence line, or on adjacent areas of the Site, as directed by Engineer.
   3. When solid rock is encountered at ground surface, drill into rock at least 12 inches for line-posts and at least 1.5 feet for end-, pull-, corner-, and gate-posts. Drill hole at least one inch greater diameter than largest dimension of post to be placed.
      a. If solid rock is below soil overburden, drill to full depth required, except penetration into rock need not exceed the minimum depths specified above for rock encountered at ground surface.

C. Setting Posts: Remove loose and foreign materials from sides and bottoms of holes, and moisten soil prior to placing concrete.
   1. Center and align posts in holes 3-inches above bottom of excavation.
   2. Posts shall be set in concrete footings, except as otherwise shown or specified. Place concrete around posts in continuous pour, and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
   3. Extend concrete to two inches above ground surface, or to two inches below ground surface if cover of sod, bituminous asphalt paving, or other material is shown or indicated to conceal concrete. Crown to shed water away from posts.
   4. Extend footings for gate posts to underside of bottom hinge. Set keeps, stops, sleeves, and other accessories into concrete as required.
   5. Keep exposed concrete surfaces moist for at least seven days after placement, or cure with membrane curing materials, or other acceptable curing method.

D. Concrete Strength: Allow concrete to attain at least 75 percent of its minimum 28-day compressive strength, but in no case sooner than seven days after placement, before installing rails, tension wires, barbed wire, or chain-link fabric.
   1. Do not stretch and tension fabric and wires, and do not hang gates, until concrete has attained its full design strength.

E. Posts and Rails:
   1. Line Posts: Set posts in cast-in-place concrete footings as specified, spaced not more than ten feet on centers. Provide caps on top of each post to exclude moisture and to receive top rail, unless equal protection is afforded by combination post-top cap and barbed wire supporting arm, where barbed wire is required.
   2. Top Rails: Run rail continuously through post caps or extension arms, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer to form continuous rail between terminal posts.
   3. Center Rails: Provide center rails, erected in one piece between posts and flush with post on fabric side, using special offset fittings where necessary.
   4. Brace Assemblies: Install braces so posts are plumb when diagonal rod are under proper tension. Install brace assemblies at end-posts and at both sides of corner- and pull-post panels. Panels adjacent to gates shall have intermediate horizontal rails and diagonal bracing. Diagonal bracing shall run from center of first line-post to bottom of terminal-post.

F. Chain-Link Fabric:
   1. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released. Fasten to terminal posts and gate posts with tension bars threaded through mesh and secured with tension bands at maximum intervals of 14 inches.
   2. Tie to line-posts, gate frames and top and bottom rails with tie wires spaced at maximum 12 inches on posts and two feet on rails.
   3. Connect tension bars to posts and frames by means of adjustable bolts and bands spaced not more than 14 inches apart.
   4. Leave approximately two inches between finish ground surface and bottom selvage, except where bottom of fabric extends into concrete.
   5. Join roll of chain-link fabric by weaving a single picket into the ends of roll to form continuous mesh.

G. Barbed Wire:
   1. Install three parallel wires on each extension arm; on security side of fence, unless otherwise shown or indicated
   2. Pull wire taut to remove sag and firmly install in slots of extension arms to prevent movement or displacement.
   3. Secure wire to terminal posts utilizing terminal post band arms or brace bands.
   4. Extend vertical members of gates to receive barbed wire.

H. Stretcher Bars: Thread through or clamp to fabric four inches on centers, and secure to posts with metal bands spaced 15 inches on centers.

I. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage, as shown on approved Shop Drawings. Adjust hardware for smooth operation and lubricate where necessary.

J. Tie Wires: Use U-shaped wires conforming to diameter of pipe. Clasp pipe and fabric firmly with ends twisted at least two full turns. Bend ends of wire to minimize hazard to persons and clothing.

K. Fasteners: Install nuts for tension band and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.3 ADJUSTMENT AND CLEANING

A. Repair coatings damaged in the shop or at the Site by recoating with manufacturer's recommended repair compound, applied in accordance with manufacturer's directions. Repair hot-dip galvanized coatings in accordance with ASTM A780.

B. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, and malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

C. Lubricate operating equipment and clean exposed surfaces.

D. Repair and replace broken or bent components.

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SECTION 32 92 00

LAWNS AND MEADOWS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified and required to furnish and install all lawns and meadows.
   2. Extent of lawns and meadows is shown.
   3. Types of products required include the following.
      a. Topsoil.
      b. Lawn grass seed.
      c. Sod.
      d. Inorganic soil amendments.
      e. Organic soil amendments.
      f. Fertilizers.
      g. Accessories.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with, or before, lawns and meadows.

C. Related Sections:
   1. Section 32 31 00, Fences.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. Association of Official Analytic Chemists, (AOAC).
      a. Official Methods of Analysis of AOAC International.
   2. Association of Official Seed Analysts, (AOSA).
      a. Journal of Seed Technology; Rules for Testing Seeds.
   3. American Society of Agronomy, (ASA).
      a. Reference No. 1 - Methods of Soils Analysis, Soil Science Society of America, Incorporated.
   4. American Society for Testing and Materials, (ASTM).
      a. ASTM B 221, Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
      b. ASTM C 602, Specification for Agricultural Liming Materials.
      c. ASTM D 75, Practice for Sampling Aggregates.
      d. ASTM D 422, Test Method for Particle Size Analysis of Soil.
      e. ASTM D 977, Specification for Emulsified Asphalt.

f. ASTM D 2487, Practice for Classification of Soils for Engineering Purposes (United Soil Classification System).
g. ASTM D 5268, Specification for Topsoil Used for Landscape Purposes.
h. ASTM E 329, Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
i. ASTM E 548, Guide for General Criteria Used for Evaluating Laboratory Competence.

5. Turfgrass Producers International, (TPI).
   a. Guideline Specifications to Turfgrass Sodding.

1.3 DEFINITIONS

A. The term "finish grade" shall be used to describe the finished surface elevation of planting soil.

B. The term "manufactured topsoil" shall be used to describe soil produced off-Site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil acceptable as a component of loam.

C. The term "loam" shall be used to describe topsoil that has been mixed with additional organic and inorganic additives, as specified.

D. The term "percentage pure live seed" shall be defined as the percent (%) purity multiplied by percent (%) germination divided by 100 to equal the percent pure live seed (PLS) and shall be calculated for all seed lots using each seed lots own unique purity and germination test results. A PLS pound shall be defined as the bulk weight of seed required to equal one pound of 100 percent pure, germinated seed.

E. The term "subgrade" shall be used to describe the surface of subsoil remaining after completing excavation; or the top surface of a fill or backfill immediately beneath topsoil and which has not been tested for acceptable use as topsoil.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Engage a single landscape installer skilled, trained and with successful and documented experience in the planting of lawns and meadows and with specific skill and successful experience in the installation of the types of materials required; and who agrees to employ only tradesmen with specific skill and successful experience in this type of Work. Submit names and qualifications to Engineer along with the following information on a minimum of three successful projects:
      a. Names and telephone numbers of owner, architects or engineers responsible for projects.
      b. Approximate contract cost of the lawns and meadows.
      c. Amount of area installed.
   2. Installer's Site Supervisor: Require installer to maintain an experienced full-time landscape supervisor on-Site during the time of preparation for, and

planting of, lawns and meadows. Supervisor shall have achieved landscape or horticultural certification acceptable to governing authorities having jurisdiction at the Site.

3. Ratio of laborers to certified landscape supervisors shall not exceed 12 to one. Certified landscape supervisor shall be on-Site throughout the day-to-day performance of the Work of this Section.
4. Application of herbicides, chemicals and insecticides shall be done by personnel licensed to perform such applications by governing authorities having jurisdiction at the Site and in accordance with each manufacturer's instructions provided on each product label.

B. Soil-Testing Laboratory Qualifications:
   1. An independent laboratory, recognized by governing authorities having jurisdiction at the Site, with the experience and capability to conduct testing indicated and that specializes in types of soil tests to be performed.
   2. To qualify for approval, an independent testing agency shall demonstrate to Engineer's satisfaction, based on evaluation of criteria submitted by testing agency, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work, in accordance with ASTM E 329 and as documented according to ASTM E 548.

C. References: Comply with the applicable requirements referenced in Section 01 42 00, References.

D. Soil Analysis: Furnish report of soil analysis to Engineer, prepared by a qualified soil-testing laboratory, stating percentages of organic matter; mechanical gradation of sand, silt, and clay content in compliance with ASTM D 422; cation exchange capacity; sodium absorption ratio; deleterious materials content; pH; and mineral and plant-nutrient content of soil. Chemical analysis shall include tests for percentages of nitrate nitrogen, ammonium nitrogen, phosphorus, potassium, calcium, iron, manganese, copper, zinc, extractable aluminum, and total soluble salts.
   1. Manufactured Imported Topsoil:
      a. Test each 1000 cubic yards of manufactured topsoil at the proposed source. In addition, after Engineer's approval of manufactured topsoil based on results and recommendations of soil testing reports, test each 1000 cubic yards of manufactured topsoil that is delivered to the Site for conformance to results and recommended modifications of approved soil test reports. Manufactured topsoil that differs from proposed source material, after modification according to recommendations of soil test reports, shall be rejected for use in the Work.
      b. Obtain a one cubic foot representative sample for each 1000 cubic yards of manufactured topsoil proposed for lawn and meadow Work, in compliance with ASTM D 75 and Appendixes, for securing samples from stockpiles.
      c. Place samples taken from each stockpile into separate clean, new and previously unused, containers and mix thoroughly. Maintain separation and legible labeling of each sample, taken from each stockpile,

throughout the process of mixing, drying and delivering to soil analysis laboratory. Label samples on outside of container.

d. Take one cup of topsoil from each container and allow to dry at room temperature. Once dry, place each one-cup sample in a separate, accurately labeled, new and previously unused one-cup sized plastic container, seal tightly and deliver to soil testing laboratory.

e. Report suitability of manufactured topsoil as a component for lawn growth. State recommended quantities of nitrogen, phosphorus, secondary and micronutrients, potash and soil amendments to be added to produce satisfactory manufactured topsoil. Include calculations, types of fertilizer and recommendations for application rates in either gallons or pounds per cubic foot of manufactured topsoil.

f. Organic component of manufactured topsoil shall be obtained from compost and peat moss amendments specified, for such material to be used as loam.

E. Source Quality Control:

1. Analysis and Standards: Package all products with manufacturer's certified analysis performed in accordance with methods established by AOAC, wherever applicable, or as specified.
2. Provide manufactured imported topsoil from a commercial processing facility specializing in the manufacture of topsoil.
3. Seed that has been stored at temperatures, or under conditions not recommended by the seed supplier, or has become wet, moldy, or otherwise damaged, shall not be acceptable. The PLS for each seed lot shall be 75 percent, minimum.
4. Certify that all seed has been stored under conditions recommended by the seed supplier and has not been subjected to conditions damaging to PLS percentages.
5. Seed may be mixed by an approved method on-Site or at the seed supplier’s facilities. If the seed is mixed on-Site, each variety shall be delivered in the original containers and shall bear the supplier’s certified analysis. Where seed is mixed by the seed supplier, provide Engineer with the seed supplier’s certified statement as to the composition of the mixture.

1.5 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:
   a. Schedule for lawn-planting showing anticipated planting dates for each type of Work.
2. Product Data:
   a. Manufacturer's product data, specifications and installation instructions for all required materials.
   b. Composition and analysis of commercial fertilizers and all purchase receipts showing the total quantity actually purchased for this Project.
   c. PLS for each type of seed and each seed lot. Include bulk weight of seed required to equal one pound of 100 percent pure, germinated seed.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Certification of Grass and Wildflower Seed: For each grass-seed monostand and seed mixture, furnish seed supplier's certification stating the botanical and common name, and percentage by weight of each species and variety, and percentage of purity, germination and weed seed. Include the year of production and date of packaging. Certify that seed has been stored in compliance with all recommendations of the seed supplier.
      b. Certificates of inspection as may be required by governmental authorities to accompany shipments, and manufacturer's certified analysis for soil amendments and fertilizer materials. For standard products submit other data substantiating that materials comply with specified requirements.
   2. Test Reports: Submit the following:
      a. Soil analysis reports for imported manufactured topsoil, as specified. Include recommendations for remediating existing soil into acceptable topsoil.
   3. Qualifications Data: Submit qualifications data for the following:
      a. Landscape installer.
      b. Landscape supervisor.
      c. Testing agency.
   4. Source Quality Control Submittals
      a. Written statement providing the location from which manufactured topsoil is to be obtained and the names and addresses of the suppliers.

C. Closeout Submittals: Submit the following:
   1. Operations and Maintenance Data:
      a. Submit recommended procedures to be established by Owner for the maintenance of lawns and meadows for one full year. Submit prior to expiration of required maintenance period.
   2. Warranty Documentation:
      a. Submit written warranty, signed by Contractor and landscape installer, as specified.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:
   1. Do not deliver seed until Site conditions are ready for installation.
   2. Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery.
   3. Deliver seed in undamaged, original containers, sealed by the supplier and indicating compliance with approved Shop Drawings.
   4. Inspect lawn materials upon arrival at Site. Immediately and permanently remove unacceptable materials from Site.

B. Storage of Materials:

1. Store and cover materials to prevent deterioration. Remove packaged materials that become wet or show deterioration or water marks from the Site.
2. Seed that becomes wet, moldy or damaged during the time of storage on-Site or that has been damaged during transit is not acceptable.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Proceed with and complete lawn planting as rapidly as portions of the Site become available, working within the seasonal limitations for each type of lawn and grass planting required.
   2. Proceed with planting only when current and forecasted weather conditions are favorable to successful planting and establishment of lawns.
      a. Do not spread seed when wind velocity exceeds five miles per hour.
      b. Do not plant when drought, or excessive moisture, or other unsatisfactory conditions prevail.
   3. Herbicides, chemicals and insecticides shall not be used on areas bordering wetlands.

B. Scheduling:
   1. Coordinate planting with specified extended service periods to provide required service from date of Substantial Completion. Plant during one of the following periods:
      a. Spring Planting: March 15 to June 1.
      b. Fall Planting: September 1 to October 30.
   2. Do not begin lawn planting until water, acceptable for use and adequate in supply, is available on-Site and can be successfully transported to the areas of Work. Coordinate provision of adequate and acceptable water supply with Project Schedule.
   3. Do not proceed with installation of loam until all subgrade utility services have been installed, are operating successfully and have been approved by Engineer.

C. Pre-installation Conference:
   1. Prior to commencement of lawn planting and associated Work, Contractor shall schedule and meet at the Site with the landscape installer, the installers of other Work in and around lawn areas that follows the lawn Work, including fencing Work specified in Section 32 31 00, Fences; and Engineer and other representatives directly concerned with performance of the Work. Review foreseeable methods and procedures related to the lawn and meadow Work, including the following:
      a. Review Project requirements and the Contract Documents.
      b. Review required submittals, both completed and yet to be completed.
      c. Review availability of water and methods of delivery.
      d. Review status of below-grade work and required access during lawn and meadow planting and establishment.
      e. Review Project Schedule and availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.

f. Review environmental conditions, other Project conditions, and procedures for coping with unfavorable conditions.
g. Review procedures required for protection of lawns during the remainder of the construction period.
h. Review required inspection, testing, and certifying procedures.

2. Record the discussions of the Pre-installation Conference and the decisions and agreements or disagreements reached, and furnish a copy of the record to each party attending.
3. Record all revisions or changes agreed upon, reasons therefor, and parties agreeing or disagreeing with them.
4. Reconvene the meeting at the earliest opportunity if additional information must be developed in order to conclude the subjects under consideration.

1.8 WARRANTY

A. General Warranty: The special warranties specified in this Article shall not deprive Owner of other rights or remedies Owner may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under the Contract Documents.

B. Special Warranties: Warranty lawns and meadows through the specified extended service period.

1.9 EXTENDED SERVICE

A. Extended Lawn Service:
1. Begin extended service immediately after each lawn area is acceptably established. Provide extended service for not less than the following periods:
2. Seeded Lawns: Sixty days from date after lawn areas are acceptably established.
a. When full service period has not elapsed before end of planting season, or if lawn is not acceptably established, continue service during next planting season.
3. Service lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
4. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources. Keep newly germinated plants uniformly moist to a depth of 4-inches, applied at a minimum rate of 1-inch per week, or greater as required to maintain minimum moisture depth specified. Provide and maintain watering gages and soil moisture probes until end of maintenance period.
a. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
b. After plants have their first true leaves and grasses show mature blades, watering shall be performed to provide moisture to a depth of 6-inches, and not performed again until top 1-inch of loam has dried.

5. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass-leaf height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowing to maintain the following grass height:
    a. Mow grass 1-1/2 to 2-inches high.
6. Lawn Fertilization: Apply fertilizer after initial mowing and when grass is dry.
    a. Use fertilizer that will provide actual nitrogen of at least one pound for each 1000 square feet of lawn area.
7. After seed has passed its expected germination period, reseed all areas and parts of areas that fail to show a uniform stand of grass. Reseed repeatedly until all areas are covered with grass.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Topsoil:
1. All soil accepted as topsoil, whether obtained from on-Site or off-Site sources, shall comply with specified topsoil analysis.
2. Provide fertile, friable, natural loam, surface soil, capable of sustaining vigorous plant growth; free of any admixture of subsoil, clods of hard earth, plants or roots, sticks, stones larger than 1-inch in diameter, or other extraneous material harmful to plant growth, in compliance with ASTM D 5268. Provide topsoil with the following analysis:
    a. 3/4-inch mesh: 100 percent passing.
    b. No. 4-sieve: 90 to 100 percent passing.
    c. No. 200-sieve: 0 to 10 percent passing.
    d. Clay content of material passing No. 200-sieve not greater than 60 percent, as determined by hydrometer tests.
    e. pH-adjusted with ferrous sulphate or ground limestone to provide pH 5.5 to pH 7.0 at time of installation of lawns, grass and meadow areas, unless particular species of grass or wildflower stand requires a different pH to meet its growing needs.
    f. Electrical conductivity of a 1:2 soil-water suspension shall not exceed 1.0 milliohm per centimeter and with less than 200 parts per million of extractable aluminum.
    g. Cation Exchange Capacity: 5, minimum.
    h. Organic content not less than five percent, as determined by ignition loss of oven-dried samples passing No. 10-sieve (Muffle Furnace Temperature: 110 plus or minus five degrees C for eight hours).
    i. Free of pests and pest larvae.
3. Topsoil Source: Amend existing in-place surface soil to produce topsoil, where possible. Verify suitability of surface soil to produce topsoil, as

specified. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

a. Supplement acceptable surface soil with manufactured topsoil from off-Site sources, when quantities available on Site are insufficient to complete the Work.

B. Lawn Grass Seed:

1. Lawn Grass Seed Mixture: Provide fresh, clean, new-crop seed complying with the tolerance for purity and germination established by AOSA. Provide seed of the grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, specified.
2. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 80 percent pure seed, and not more than 0.25 percent weed seed by weight:
   a. Full Sun: Kentucky Bluegrass (Poa pratensis), a minimum of three cultivars.
   b. Sun and Partial Shade: Proportioned by weight as follows:
      1) 50 percent Kentucky Bluegrass (Poa pratensis).
      2) 30 percent Chewings Red Fescue (Festuca rubra variety).
      3) 10 percent Perennial Ryegrass (Lolium perenne).
      4) 10 percent Redtop (Agrostis alba).
   c. Shade: Proportioned by weight as follows:
      1) 50 percent Chewings Red Fescue (Festuca rubra variety).
      2) 35 percent Rough Bluegrass (Poa trivialis).
      3) 15 percent Redtop (Agrostis alba).

C. Inorganic Soil Amendments:

1. Ground Dolomitic Limestone: ASTM C 602, agricultural limestone containing a minimum 80 percent magnesium carbonate equivalent and as follows:
   a. Class: Class O, with a minimum 95 percent passing through No. 8-sieve and a minimum 55 percent passing through No. 60-sieve.
2. Perlite: Agricultural-grade, expanded pumice.
3. Agricultural Gypsum: Commercial-grade and finely ground, containing a minimum of 90 percent calcium sulfate.
4. Grit Aggregate: Commercial-grade filter sand consisting of hard, durable rounded grains of quartz or other rock that do not compact to a solid mass when wet, with a pH in the range required for topsoil. Provide clean, washed, natural or manufactured aggregate, free of toxic materials, salt and other chemical contamination.

D. Organic Soil Amendments:

1. Compost: Well-composted, stable, weed-free organic matter, produced by the aerobic decomposition of organic residues; pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through a 1-inch screen; soluble salt content of 5 to 10 decisiemens/meter; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

a. Organic Matter Content: 50 to 60 percent of dry weight.
b. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2. Peat: Partially decomposed stems and leaves of several species of sphagnum moss; finely divided or granular texture. Supply shredded material, free from lumps, wood, roots, stones, decomposed collodial residue and other extraneous foreign matter, capable of passing through a 1/2-inch screen, which can easily be incorporated with the soil. Supply material, which has been conditioned in storage piles after excavation for at least six months, including one freezing and thawing period. Supply peat humus with the following analysis:
   a. Not less than 90 percent organic matter by weight on an ovendry basis.
   b. pH range of 3.4 to 4.8.
   c. Moisture content 35 percent at time of incorporation into soil.
   d. Water absorbing ability 150 percent to 350 percent by weight.
3. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
   a. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with at least 0.15 pounds of ammonium nitrate or 0.25 pounds of ammonium sulfate per cubic foot of loose sawdust or ground bark.
4. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

E. Fertilizers:
1. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of four percent nitrogen and 20 percent phosphoric acid.
2. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
3. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
   a. Composition: When applied, composition of fertilizer shall provide one pound of nitrogen per 1000 square feet; including four percent phosphorous, and two percent potassium, by weight.
4. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
   a. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

F. Mulches:
1. Straw Mulch: Provide air-dry, clean, mildew- and certified seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch screen; soluble salt content of 5 to 10 decisiemens/meter; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
    a. Organic Matter Content: 50 to 60 percent of dry weight.
    b. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

G. Accessories:
1. Provide herbicides, chemicals and insecticides as needed for disease, fungus or pest control. All herbicides, chemicals and insecticides shall be bear approval labels indicating they are approved by the United States Department of Agriculture for the intended uses and application rates.
2. Post Emergent Crab Grass and Plantain Chemical: Provide recommended post emergent crab grass and plantain control throughout the maintenance period to ensure germinated and established lawns free of crab grass and other undesirable grasses and forbs.

H. Water: Acceptable for lawn and containing no material harmful to plant growth and establishment.

2.2 LOAM MIXES

A. Follow recommendations of soil-testing laboratory for modifying on-Site soil and manufactured soil, for use as topsoil.

B. On-Site soil and manufactured soil that has been provided with all inorganic soil amendments and fertilizers recommended by soil-testing laboratory, and acceptable for use as topsoil, shall be mixed with an additional organic soil amendment mix in a ratio of two parts topsoil to one part organic soil amendment mix, by volume.
1. Prepare soil amendment mix by combining 40 percent compost, 40 percent peat moss, ten percent wood derivatives, five percent well-rotted manure and five percent grit aggregate, by volume.

C. Loam: Thoroughly blend topsoil with organic soil amendment mix and use as planting media for all lawn Work.

PART 3 - EXECUTION

3.1 INSPECTION

A. Contractor shall examine the areas and conditions under which lawn and meadow Work is to be performed, and notify Engineer, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

3.2 PREPARATION

A. Thoroughly blend and mix loam before spreading. Incorporate fertilizers, and ground limestone or acidulant, after spreading, as specified, and at rates recommended by soil-testing laboratory.

B. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

C. Perform percolation tests on existing subgrade and placed fills prior to fine grading.
   1. Perform percolation testing of subgrades and placed fills to determine whether or not the subgrade will drain properly. Perform percolation tests in accordance with the following procedure:
      a. Dig a hole in the subgrade that is 4-inches in diameter and 12-inches deep.
      b. Fill the hole with water and wait for the water to completely drain from the hole.
      c. Immediately refill the hole with water and measure the rate of fall in the water level.
   2. In the event that water drains at a rate less than 1-inch in one hour, excavate soil to a minimum depth of 24-inches, and deeper, as necessary to break the compaction. Backfill, recompact and retest each area so prepared to confirm drainage rates exceed one inch in one hour.
   3. Perform minimum of one soil percolation test for every 10,000 square feet of lawn and meadow area.

D. Excavate or fill subgrade, as required, to bring subgrade to elevations shown. Maintain all angles of repose. Confirm that subgrade is at proper elevations and that no further earthwork is required to bring the subgrade to proper elevations. Provide subgrade elevations that slope parallel to finished grade and towards subsurface drains shown.

E. Remove all construction debris, trash, rubble and all extraneous materials from subgrade. In the event that fuels, oils, concrete washout or other material harmful to plant growth or germination have been spilled into the subgrade, excavate the subgrade sufficiently to remove all such harmful materials and fill with approved fill, compacted to the required subgrade compaction level.

3.3 FINE GRADING

A. Immediately prior to dumping and spreading loam, clean subgrade of all stones greater than 2-inches and all other extraneous matter. Remove all such material from Site. Notify Engineer that subgrade has been cleaned, and obtain approval prior to spreading loam.

B. Do not attempt to spread excessively wet, muddy or frozen loam. Do not spread loam more than five days before seeding or planting.

C. Spread loam to a depth of 4 but not less than required to meet finish grades after light rolling and natural settlement.
   1. Spread approximately one-half the thickness of required loam depth. After spreading loam, rototill, disk or harrow loam and subgrade to bring top 2-inches of subgrade upward into loam layer, so that there is a transitional layer between loam and subgrade.
   2. Spread remainder of loam to required finish grades.
   3. Compact each lift sufficiently to reduce settling, but not enough to prevent the movement of water and feeder roots through loam. After compaction spread loam should offer firm, even resistance when a soil sampling tube is inserted.
   4. Phase the placement of the final lift so that wheeled vehicles do not have to travel over areas where final lifts are already in-place.
   5. Spread and compact to a smooth, uniform surface plane, to within plus or minus 1/2-inch of finish elevations. Roll and rake and remove all ridges, and fill depressions, as required. Remove all stones larger than 1-inch in any dimension and all sticks, roots, trash and other extraneous matter.
   6. Perform percolation tests as for subgrades, except limit depth of holes to 2/3 the depth of loam layer.

D. Spread ground limestone or acidulant and fertilizer, as specified. Mix ground limestone with dry loam before spreading fertilizer and work lightly into the top 4-inches of loam by harrowing or tilling at least three days before applying commercial fertilizers.

E. Grade planting areas to smooth, even surface with loose, uniformly fine texture. Remove all stones and extraneous material in excess of 1-inch diameter. Roll, rake and remove ridges and fill depressions, as required to meet finish grades.

F. Moisten prepared areas before seeding, sodding, sprigging or plugging. Water thoroughly and allow surface moisture to dry before planting. Do not create a muddy loam condition.

G. Prior to seeding or planting, restore loam to specified condition, if eroded or otherwise disturbed.

3.4 CONVENTIONAL SEEDING

A. General: Maintain grade stakes until removal is mutually agreed upon by all parties concerned.

B. Rake or harrow all seedbeds immediately prior to seeding to produce a rough, grooved surface, no deeper than 1-inch. Seed only when seedbed is in a friable condition and not muddy or hard.

C. Sow seed using a spreader or seeding machine.

D. Distribute seed evenly over entire area by sowing equal quantity in two directions at right angles to each other.

E. Sow lawn grass seed mixture at the rate of not less than five pounds for every 1000 square feet.

F. Cultipacker, or approved similar equipment, may be used to cover the seed and to firm the seedbed in one operation. In areas inaccessible to cultipacker:
   1. Rake the seed lightly into top 1/8-inch of loam, roll in two directions with a water ballast roller, weighing not less than 100 pounds per linear foot.
   2. Take care during raking that seed is not raked from one spot to another.
   3. Protect seeded areas against erosion by spreading specified mulch after completion of seeding operations.
      a. Protect seeded areas against hot, dry weather or drying winds by applying peat moss mulch not more than 24 hours after completion of seeding operations. Presoak and scatter evenly to a depth of from 1/8-inch to 3/16-inches thick and roll to a smooth surface. Do not mound.
      b. Spread straw mulch to form a continuous loose blanket not less than 1-1/2-inch deep over seeded areas at the approximately rate of two tons-per acre.
         1) Anchor mulch by spraying with asphalt emulsion at the rate of ten to 13-gallons per 1000 square feet.
         2) Place mulch with equipment that will blow or eject, by means of a constant air stream, controlled quantities of the mulch and asphalt in a uniform pattern over the specified area. If the mulch is excessively cut or broken, take measures to reduce the cutting or breakage. Introduce the asphalt into the air stream by means of a spray arranged so that it will partially coat the mulch with a spotty asphalt tack prior to the depositing of the mulch covering. Rate of application not less than 75-gallons per ton of mulch.

G. Using a uniform fine spray, thoroughly and evenly water seeded areas. Provide adequate water to moisten seedbed to a depth of 2-inches.
   1. Repeat this process when peat mulch color lightens. Maintain all seedbeds in a uniformly moist condition, conducive to seed germination and plant establishment, as specified.

H. Reseed areas that remain without mulch for longer than three days.

I. Take precautions to prevent damage or staining of construction or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

J. Prevent foot or vehicular traffic, or the movement of equipment, over the mulched areas. Reseed areas damaged as a result of such activity.

3.5 RECONDITIONING EXISTING LAWNS

A. Recondition existing lawn damaged by Contractor's operations, including areas used for storage of materials or equipment and areas damaged by movement of vehicles. Recondition existing lawns and meadow areas where minor regrading is required.

B. Recondition other existing lawn areas shown.

C. Provide fertilizer, seed and soil amendments, as specified for new lawn and meadow, and as required to provide satisfactorily reconditioned lawns and meadows. Provide new loam as required to fill low spots and meet new finish grades.

D. Till stripped, bare, and compacted areas thoroughly to a depth of 12-inches.

E. Remove diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing extraneous materials resulting from Contractor's operations including oil drippings, stone, gravel and other construction materials.

F. In areas approved by Engineer, where substantial lawns remain (but are thin), mow, dethatch, core aerate and rake. Fill low spots, remove humps, cultivate soil, fertilize, and seed. Remove weeds before seeding or if extensive, apply selective chemical weed killers, as required. Apply a seedbed mulch, if required, to maintain moist condition.

G. Water newly planted areas and keep moist until new lawns are established, as specified.

3.6 ACCEPTANCE CRITERIA FOR LAWNS

A. Lawn Work will be considered acceptable when:
   1. Seeded Lawn: When a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 square feet and bare spots not exceeding 5-inches by 5-inches.

3.7 CLEANUP AND PROTECTION

A. Promptly remove soil and debris, created by lawn Work, from paved areas. Clean wheels of vehicles before leaving Site to avoid tracking soil and loam onto roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout extended service period and remove when service period ends. Treat, repair or replace damaged lawns and meadows.

3.8 INSPECTION AND ACCEPTANCE

A. Where lawns do not comply with specified acceptance criteria, reestablish lawns and meadows and continue extended service period until lawns and meadows comply with criteria for acceptance.

3.9 DEMONSTRATION

A. Engage installer's Site supervisor to train and instruct Owner's personnel in the proper maintenance of lawns and procedures to be performed throughout the year for proper care and maintenance of lawn and meadows.
   1. Include instructions and training on reconditioning established lawns and sources of lawn materials.
   2. Schedule training with Owner, through Engineer, with at least seven days' advance notice.

B. Review Operation and Maintenance information and be sure all instructions are clearly understood by Owner's personnel and are supplemented with additional information, clarifications and instructions, as required.

C. Provide minimum of two, nonconsecutive, full days on-Site training time during day shift normal working hours.

+ + END OF SECTION + +

SECTION 40 05 05

EXPOSED PIPING INSTALLATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified, and required to install and test all exposed piping, fittings, and specials. The Work includes the following:
      a. All types and sizes of exposed piping, except where exposed piping installations are specified under other Sections or other contracts.
      b. Unless otherwise shown or specified, this Section includes all piping beginning at the outside face of structures or structure foundations and extending into the structure. Piping embedded in concrete within a structure or foundation shall be considered as exposed and is included herein. Piping that is permanently or intermittently submerged, or installed in sub-aqueous environments, is considered as exposed and is included in this Section.
      c. Work on or affecting existing exposed piping.
      d. Installation of all jointing and gasket materials, specials, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, tie rods, and all Work required for a complete exposed piping installation.
      e. Supports, restraints, and other anchors.
      f. Field quality control, including testing.
      g. Cleaning and disinfecting.
      h. Incorporation of valves, meters, and special items shown or specified into the piping systems per the Contract Documents and as required.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before exposed piping Work.
   2. Coordinate with appropriate piping Sections of Division 40, Mechanical.

C. Related Sections:
   1. Section 09 91 00, Painting.
   2. Section 10 14 00, Signage.
   3. Section 40 05 07, Pipe Hangers and Supports.
   4. Section 40 05 06, Couplings, Adapters, and Specials for Process Piping.
   5. Section 40 05 08, Wall Pipes, Floor Pipes and Pipe Sleeves.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings
   2. ASME B31.3, Process Piping.

3. American Society for Non-Destructive Testing (ASNT), ASNT-TC-1A, Recommended Practice, Personnel Qualification, and Certification in Non-destructive Testing.
4. ASTM B32, Specification for Solder Metal.
5. ANSI/AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
6. ANSI/AWWA C600, Installation of Ductile Iron Water Mains and Their Appurtenances.
7. ANSI/AWWA C651, Disinfecting Water Mains.
8. AWWA M11, Steel Pipe - A Guide for Design and Installation.
9. AWWA M23, PVC Piping - Design and Installation.
10. AWWA M41, Ductile-Iron Pipe and Fittings.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with requirements and recommendations of authorities having jurisdiction over the Work, including:
      a. Westchester County Department of Environmental Facilities.
      b. Westchester Joint Water Works (WJWW)

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Detailed drawings in plan and, as applicable, section.
      b. Details of piping, valves, supports, accessories, specials, joints, harnessing, and main anchor supports, and connections to existing piping, structures, equipment, and appurtenances.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Submit a certificate, signed by manufacturer of each product, certifying that product complies with applicable referenced standards.
   2. Source Quality Control Submittals:
      a. Submit copies of testing report for each test.
   3. Site Quality Control Reports:
      a. Submit copies of testing report for each test.

C. Closeout Submittals: Submit the following:
   1. Record Documentation:
      a. Maintain accurate and up-to-date record documents showing field and Shop Drawing modifications. Record documents for exposed piping Work shall show actual location of all piping and appurtenances on a copy of the Drawings, unless otherwise approved by ENGINEER.
      b. Record documents shall show piping with elevations referenced to the project datum and dimensions from permanent structures. For straight

runs of pipe provide offset dimensions as required to document pipe location.

c. Include section drawings with exposed piping record documents when the Contract Documents include section Drawings.

d. Conform to Section 01 78 39, Project Record Documents.

1.5 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver products to Site to ensure uninterrupted progress of the Work.
2. Upon delivery, inspect pipe and appurtenances for cracked, gouged, chipped, dented, and other damage and immediately remove damaged products from Site.
3. Conform to requirements of Section 01 65 00, Product Delivery Requirements.

B. Storage:

1. Store products for convenient access for inspection and identification. Store products off the ground using pallets, platforms, or other supports. Protect packaged products from corrosion and deterioration.
2. Pipe and fittings other than thermoplastic materials may be stored outdoors without cover. Thermoplastic pipe and fittings stored outdoors shall be covered.
3. Conform to requirements of Section 01 66 00, Product Storage and Handling Requirements.

C. Handling:

1. Handle pipe, fittings, specials, and accessories carefully with approved handling devices. Do not drop or roll material of delivery vehicles. Do not otherwise drop, roll, or skid piping.
2. Avoid unnecessary handling of pipe.
3. Keep pipe interiors free of dirt and foreign matter.
4. Protect interior linings and exterior coatings of pipe and fittings from damage. Replace pipe and fittings with damaged lining regardless of cause of damage. Repair damaged coatings.
5. Conform to requirements of Section 01 65 00, Product Delivery Requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Piping materials are specified in the Exposed Piping Schedule at the end of this Section. Piping materials shall conform to Specification for each type of pipe and piping appurtenances in applicable sections of Division 40, Process Integration.

B. Markings and Identification:

1. Pipe Markings:

a. Clearly mark each piece of pipe or fitting with a designation conforming to that shown on the approved Shop Drawings.

b. Manufacturer shall cast or paint on each length of pipe and each fitting the pipe material, diameter, and pressure or thickness class.

2. Pipe Identification Markers and Arrows: Refer to Section 10 14 00, Signage.

C. Appurtenances: Provide products that comply with:
1. Section 40 05 07, Pipe Hangers and Supports.
2. Section 40 05 06, Couplings, Adapters, and Specials for Process Piping.
3. Section 40 05 08, Wall Pipes, Floor Pipes and Pipe Sleeves.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work is to be installed and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
1. Install piping as shown, specified and as recommended by the pipe and fittings manufacturer.
2. If there is a conflict between manufacturer's recommendations and the Contract Documents, request in writing instructions from ENGINEER before proceeding.
3. Provide pipe manufacturer’s installation specialist at Site as specified on this Section.

B. Temporary Blind Flanges, Plugs, Caps, and Bulkheads:
1. Temporarily plug installed pipe at the end of each day of work or other interruption of pipe installation to prevent entry of animals, liquids, and persons into pipe, and entrance or insertion of deleterious materials into pipe.
2. Install standard plugs in all bells at dead ends, tees, and crosses. Cap all spigot and plain ends.
3. Fully secure and block blind flanges, plugs, caps, and bulkheads installed for testing, designed to withstand specified test pressure.
4. Where plugging is required for phasing of Work or subsequent connection of piping, install watertight, permanent type blind flanges, plugs, caps, or bulkhead acceptable to ENGINEER.

C. Piping Installation:
1. Conform to manufacturer’s instructions and requirements of standards and manuals listed in this Section, as applicable:
a. Ductile Iron Pipe: ANSI/AWWA C600, AWWA M41.
c. Steel Pipe: ASME B31.3, ANSI/AWWA C206, AWWA M11.
d. Thermoplastic Pipe: AWWA M23
2. Install straight runs true to line and elevation.
3. Install vertical pipe truly plumb in all directions.

4. Install piping parallel or perpendicular to walls of structures. Piping at angles and 45 degree runs across corners of structures will not be accepted unless specifically shown on the Contract Documents or approved by the ENGINEER.
5. Install small diameter piping generally as shown when specific locations and elevations are not indicated. Locate such piping as required to avoid ducts, equipment, beams, and other obstructions.
6. Install piping to leave all corridors, walkways, work areas, and similar spaces unobstructed. Unless otherwise approved by ENGINEER provide a minimum headroom clearance under piping and pipe supports of 7.5 feet. Clearances beneath piping shall be measured from the outermost edge of piping, flanges or other type of joint that extends beyond the nominal outside diameter of piping.
7. Protect and keep clean interiors, fittings, and valves of pipe that will convey potable water, chemicals, and other pipe designated by ENGINEER.
8. Cutting: Cut pipe from measurements verified at Site. Field cut pipe, where required, with a machine specially designed for cutting type of pipe being installed. Make cuts carefully without damage to pipe, coating, or lining, and with a smooth end at right angles to axis of pipe. Cut ends of push-on joint type pipe shall be tapered and sharp edges filed off smooth. Do not flame-cut pipe.

D. Jointing Pipe:
1. General:
   a. Make joints in accordance with pipe manufacturer's recommendations and Contract Documents.
   b. Cut piping accurately and squarely and install without forcing or springing.
   c. Ream out pipes and tubing to full inside diameter after cutting. Remove all sharp edges on end cuts.
   d. Remove all cuttings and foreign matter from inside of pipe and tubing before installation. Thoroughly clean all pipe, fittings, valves, specials, and accessories before installing.

2. Ductile Iron and Steel Flanged Joints:
   a. Assemble flanged joints using ring-type gaskets, with thickness as recommended by pipe manufacturer but not less than 1/8-inch thick, for raised-face flanges. Use full-face gaskets for flat-face flanges, unless otherwise approved by ENGINEER or recommended by pipe manufacturer. Gaskets shall be suitable for the service intended in accordance with the manufacturer's ratings and instructions. Gaskets shall be properly centered.
   b. Tighten bolts in a sequence that provides equal distribution of bolt loads.
   c. Length of bolts shall be uniform. Bolts shall not project beyond the nut more than 1/4-inch or fall short of the nut when fully taken up. Machine-cut ends of bolts to be neatly rounded. Do not use washers.
   d. Prior to assembly of flanged joints, lubricate bolt threads and gasket faces.
   e. Alternately tighten bolts 180 degrees apart to compress the gasket evenly.

f. After assembly, coat all bolts and nuts, except stainless steel bolts and nuts, with same coating specified in Section 09 91 00, Painting, for material of pipe and fittings being joined.

3. Thermoplastic Pipe Joints:
   a. Solvent Cement Welded Joints:
      1) Bevel pipe ends and remove all burrs before making joint. Clean pipe and fittings thoroughly. Do not make solvent cement joints if temperature is below 40 degrees F. Do not make solvent cement welded joints in wet conditions.
      2) Use solvent cement supplied or recommended by pipe manufacturer.
      3) Apply joint primer and solvent cement and assemble joints in accordance with recommendations and instructions of manufacturer of joint materials and pipe manufacturer.
      4) Implement appropriate safety precautions when using joint primers and solvent cements. Allow air to circulate freely through pipelines to allow solvent vapors to escape. Slowly admit fluid when flushing or filling pipelines to prevent compression of gases within pipes.
   b. Threaded Joints:
      1) Cut pipe square and smooth and remove burrs or raised edges with a knife or file.
      2) Hold pipe firmly in a pipe vise. Protect pipe at the point of grip by inserting a rubber sheet or other material between pipe and vise.
      3) Thread pipe in accordance with pipe manufacturer's recommendations. Brush threads clean of chips and ribbons.
      4) After threading pipe, starting with second full thread, and continuing over thread length, wrap 100-percent virgin TFE (Teflon) thread tape in direction of threads. Overlap each wrap by one-half width of tape.
      5) After application of the TFE thread tape, screw fitting or coupling onto the pipe end to be joined and tighten by hand. Using a strap wrench only, further tighten connection an additional one to two threads past hand tightness.
   c. Bell and Spigot Joints:
      1) Bevel pipe ends, remove all burrs, and provide a reference mark at correct distance from pipe end before making joint.
      2) Clean spigot end and bell thoroughly before making the joint. Insert O-ring gasket while ensuring that gasket is properly oriented. Lubricate spigot with manufacturer’s recommended lubricant. Do not lubricate bell and O-ring. Insert spigot end of pipe carefully into bell until reference mark on spigot is flush with bell.

4. Copper Tubing Joints:
   a. Soldered Joints:
      1) Assemble copper tubing with soldered joints. Solder shall be 95-5 tin-antimony solder conforming to ASTM B32.
      2) Ream or file pipe to remove burrs.
      3) Clean and polish contact surfaces of joints.
      4) Apply flux to both male and female ends.

5) Insert end of tube into full depth of fitting socket.
6) Heat joint evenly.
7) Form continuous solder bead around entire circumference of joint starting at the bottom.

b. Threaded Joints:
1) When open flames for soldering are impractical, or at unions and connections to equipment and appurtenances, assemble copper tubing with flared ends as permitted by authority having jurisdiction.
2) Ends of tubing shall be flared at an angle of 45 degrees with flaring tool recommended by pipe manufacturer. Flaring tool shall have same outside diameter as tube to be flared.
3) Tubing to be flared shall be soft temper or annealed prior to flaring.
4) Cut end of tube square and ream to remove burrs.
5) Resize back to round tube that is out-of-round.
6) Clean and polish contact surfaces of joints using an abrasive cloth.
7) Place flare nut over end of tube with threads closest to end being flared.
8) Insert appropriate length of tube between flaring bar of flaring tool and position yolk with flaring cone over tube end and clamp yoke in place.
9) Turn handle of yolk clockwise without over-tightening. Cracked or deformed tubes will be rejected.
10) Do not apply jointing compounds to mating surfaces of flare fitting and flared tube end before attaching flare nut to threaded connection.

5. Mechanical Coupling Joints:
a. Mechanical couplings include: sleeve-type flexible couplings, split flexible couplings, ANSI/AWWA C606 grooved or shouldered end couplings, plasticized PVC couplings, and other mechanical couplings used.
b. Prior to installing and assembling mechanical couplings, thoroughly clean joint ends with a wire brush to remove foreign matter.
c. For mechanical couplings that incorporate gaskets, after cleaning apply lubricant to rubber gasket or inside of coupling housing and to joint ends. After lubrication, install gasket around joint end of previously installed piece and mate joint end of subsequent piece to installed piece. Position gasket and place coupling housing around gasket and over grooved or shouldered joint ends. Insert bolts and install nuts tightly by hand. Tighten bolts uniformly to produce an equal pressure on all parts of housing. When housing clamps meet metal to metal, joint is complete and further tightening is not required.
d. For plasticized PVC couplings, loosen the stainless steel clamping bands and remove the clamps from the coupling. Slide the coupling over the plain ends of the pipes to be joined without using lubricants. Place clamps over each end of coupling at grooved section and tighten with a torque wrench to torque recommended by manufacturer.

E. Installing Valves and Accessories:
1. Provide supports for large valves, flow meters, and other heavy items as shown or required to prevent strain on adjoining piping.

2. Position flow measuring devices in pipe lines so that they have the amount of straight upstream and downstream runs recommended by the flow measuring device manufacturer, unless specific location dimensions are shown.
3. Position swing check valves and butterfly valves so that they do not conflict with upstream and downstream elements of the piping system.

F. Unions:
1. Install dielectric unions as specified in Section 40 05 06, Couplings, Adapters, and Specials for Process Piping**,** where dissimilar metals are connected, except for bronze or brass valves in ferrous piping.
2. Provide a union downstream of each valve with screwed connections.
3. Provide screwed or flanged unions at each piece of equipment, where shown, and where necessary to install or dismantle piping.

G. Transitions from One Type of Pipe to Another:
1. Provide all necessary adapters, specials, and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.

H. Closures:
1. Provide closure pieces, such as blind flanges and caps, shown or required to complete the Work.

3.2 THRUST RESTRAINT

A. Provide thrust restraint on all pressure piping systems and where otherwise shown or specified.
B. Thrust restraints shall be designed for axial thrust exerted by test pressure specified in the Exposed Piping Schedule at end of this Section.
C. Restrained Pipe Joints:
1. Pipe joints shall be restrained by means suitable for the type of pipe being installed.
a. Ductile Iron, Push-on Joints and Mechanical Joints: Restrain with a proprietary restrained joint system as specified in Section 40 05 19. Ductile iron pipe, lugs, and tie rods, or other joint restraint systems approved by ENGINEER. Restrain ductile iron pipe connected by flexible couplings or flanged coupling adapters by harnessing across the coupling or adapter using tie rods or extended bolts connecting between flanges.
b. Steel Pipe Joints: Provide butt-welded joints, lap welded joints, flanged joints, or mechanical coupling connections as shown and specified in Exposed Piping Schedule. Provide tie rods connected to lugs welded to the steel pipe for restraint at mechanical couplings.
c. Thermoplastic, FRP and HDPE Joints: Where bell and spigot-type or other non-restrained joints are utilized, provide tie rods across the joint or other suitable joint restraint system, subject to approval of ENGINEER.

3.3 WORK AFFECTING EXISTING PIPING

A. Location of Existing Piping:
   1. Locations of existing piping shown on Drawings is approximate.
   2. Determine the true location of existing piping to which connections are to be made, crossed, and that could be disturbed, and determine location of other facilities that could be affected by the Work.

B. Taking Existing Pipelines Out of Service:
   1. Conform to Section 01 14 16, Coordination with Owner's Operations.

C. Work on Existing Pipelines:
   1. Cut or tap pipes as shown or required with machines and tools specifically designed for cutting or tapping pipelines.
   2. Install temporary plugs to prevent entry of mud, dirt, water, and debris into pipe.
   3. Provide necessary adapters, sleeves, fittings, pipe, and appurtenances required to complete the Work.
   4. Conform to applicable requirements of Section 01 14 16, Coordination with Owner's Operations and Section 01 73 24, Connections to Existing Facilities.

3.4 PAINTING

A. Field painting shall conform to Section 09 91 00, Painting.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Installation Specialist:
   1. Provide services of a competent installation specialist of the pipe manufacturer when pipe installation commences for:
      b. Thermoplastic pipe.
   2. Retain installation specialist at Site for a minimum of 2 days (eight hours per day at the Site) or until competency of the pipe installation crew has been satisfactorily demonstrated to ENGINEER.

B. Testing, General:
   1. Test all piping, except as exempted in the Exposed Piping Schedule.
   2. Notification:
      a. Notify ENGINEER at least 48 hours prior to testing.
      b. When authorities having jurisdiction are to witness tests, notify ENGINEER and authorities having jurisdiction in writing at least 48 hours in advance of testing.
   3. Conduct all tests in presence of ENGINEER.
   4. Remove or protect pipeline-mounted devices that could be damaged by testing.
   5. Provide all apparatus and services required for testing, including:
      a. Test pumps, compressors, hoses, calibrated gages, meters, test containers, valves, fittings, and temporary pumping systems required to maintain OWNER's operations.

b. Temporary bulkheads, bracing, blocking, and thrust restraints.

6. Provide air if an air test is required, power if pumping is required, and gases if gases are required.
7. Unless otherwise specified, OWNER will provide fluid required for hydrostatic testing. CONTRACTOR shall provide means to convey fluid for hydrostatic testing into the pipe being tested. CONTRACTOR shall provide fluid for other types of testing required.
8. Repair observed leaks and repair pipe that fails to meet acceptance criteria. Retest after repair.
9. Unless otherwise specified, testing shall include existing piping systems that connect with new piping system. Test existing pipe to nearest valve. Piping not installed by CONTRACTOR and that fails the test shall be repaired upon authorization of ENGINEER or OWNER. Repair of existing piping will be paid as extra work unless otherwise specified.

C. Test Schedule:
1. Refer to the Exposed Piping Schedule for type of test required and required test pressure.
2. Unless otherwise specified, the required test pressures are at lowest elevation of pipeline segment being tested.
3. For piping not listed in Exposed Piping Schedule:
   a. Hydrostatically test pipe that will convey liquid at a pressure greater than five psig. Provide process air pipe test for pipe that will convey air or gas under pressure or vacuum, except chlorine gas, which requires a separate test.
   b. Disinfect for bacteriological testing piping that conveys potable water.
4. Test Pressure:
   a. Use test pressures listed in Exposed Piping Schedule.
   b. If test pressure is not listed in Exposed Piping Schedule, or if a test is required for piping not listed in the Exposed Piping Schedule, test pressure will be determined by the ENGINEER based on the maximum anticipated sustained operating pressure and the methods described in the applicable ANSI/AWWA manual or standard that applies to the piping system.

D. Hydrostatic Testing:
1. Preparation for Testing:
   a. For thermoplastic pipe and FRP pipe, follow procedures described in Section 7 of ANSI/AWWA Standard C605.
   b. For HDPE pipe, follow procedures described in ASTM F2164. Test duration, including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize, shall not exceed eight hours. If re-testing of a test section or pipeline is required, at least eight hours shall elapse between tests.
   c. For steel pipe, follow procedures described in AWWA Manual M11. Wetting period is not required for pipe that is not cement-lined.
   d. For other piping follow procedures described in AWWA Manual M9. A wetting period is not required for pipe that is not cement mortar-lined.

e. Prior to testing, ensure that adequate thrust protection is in place and all joints are properly installed.

2. Test Procedure:
   a. Fill pipeline slowly to minimize air entrapment and surge pressures. Fill rate shall not exceed one foot of pipe length per second in the pipe being tested.
   b. Expel air from pipe as required. Obtain approval of ENGINEER prior to tapping pipe for expelling air.
   c. Examine joints and valves, and make repairs to eliminate visible leakage.
   d. After specified wetting period, add fluid as required to pressurize line to required test pressure. Maintain test pressure for a stabilization period of ten minutes before beginning test.
   e. HDPE Pipe: After filling pipeline, gradually pressurize pipe to test pressure and maintain required test pressure for three hours for pipe to expand. During expansion, add fluid to maintain required test pressure. Begin timed test period after expansion period and other requirements are met.
   f. Timed test period shall not begin until after the pipe has been filled, exposed to the required wetting period, air has been expelled, and pressure stabilized.
   g. Timed Test Period: After the stabilization period, maintain test pressure for at least two hours. During timed testing period, add fluid as required to maintain pressure within five psig of required test pressure. For HDPE pipe, after three hour expansion phase, reduce test pressure by ten psig and do not add liquid. The test pressure shall then remain steady for one hour, indicating no leakage.
   h. Pump from a test container to maintain test pressure. Measure volume of fluid pumped from test container and record on test report. Record pressure at test pump at fifteen minute intervals for duration of test.

3. Allowable Leakage Rates: Leakage is defined as the quantity of fluid supplied to pipe segment being tested to maintain pressure within five psi of the test pressure during timed test period. Allowable leakage rates for piping are:
   a. No Leakage: Pipe with flanged, welded, fused, threaded, soldered, or brazed joints.
   b. Rates based on formula or table in AWWA Manual M41:
      1) Metal and fiberglass pipe joined with rubber gaskets as sealing members, including the following joint types:
         a) Bell and spigot and push-on joints.
         b) Mechanical joints.
         c) Bolted sleeve type couplings.
         d) Grooved and shouldered couplings.
   c. Rates based on make-up allowance in AWWA Manual M9:
      1) Prestressed concrete cylinder pipe and other types of concrete pipe joined with O-ring rubber gasket sealing members.
   d. Rates based on formula or table in ANSI/AWWA C605:
      1) Plastic pipe joined with O-ring gasket sealing members.

3.6 CLEANING AND DISINFECTION

A. Cleaning, General: Clean pipe systems as follows:
   1. Thoroughly clean all piping, including flushing with water, dry air, or inert gas as required, in a manner approved by ENGINEER, prior to placing in service. Flush chlorine solution and sodium hypochlorite piping with water.

B. Disinfection:
   1. Disinfect all potable and finished water piping.
   2. A suggested procedure for accomplishing complete and satisfactory disinfection is specified below. Other procedures may be considered for acceptance by ENGINEER.
      a. Prior to disinfection, clean piping as specified and flush thoroughly.
      b. Conform to procedures described in ANSI/AWWA C651. Continuous feed method of disinfecting shall be used, unless alternative method is acceptable to ENGINEER.
   3. Water for initial flushing, testing, and disinfection will be furnished by OWNER. CONTRACTOR shall provide all temporary piping, hose, valves, appurtenances, and services required. Cost of water required for re-disinfection will be paid by CONTRACTOR to OWNER at the water utility's standard rates.
   4. Chlorine shall be provided by CONTRACTOR.
   5. Bacteriologic tests will be performed by CONTRACTOR.
   6. Chlorine concentration in the water entering the piping shall be between 50 and 100 ppm, such that a minimum residual concentration of 25 mg/l remains after a 24-hour retention period. Disinfect the piping and all related components. Repeat as necessary to provide complete disinfection.
   7. After required retention period, the chlorinated water shall be flushed to a closed drain line, unless otherwise directed by ENGINEER. Properly dispose of chlorinated water in accordance with applicable regulations. Do not discharge chlorinated water to storm sewers, ditches, or overland.

3.7 EXPOSED PIPING SCHEDULE

A. The schedules listed below, following the "End of Section" designation, are a part of this Specification section.
   1. Table 40 05 05-A, Exposed Piping Schedule.

+ + END OF SECTION + +

TABLE
40 05 05-A, EXPOSED PIPING SCHEDULE

Service	Diameter (inch)	Material	Interior Lining	Exterior Coating	Pressure Class/ Thickness	Joint	Test	Remarks
WWS	6, 10	DI	CL	P	Class 53	Flg	HYD (50)	
WWD	6, 10, 12	DL	CL	P	Class 53	Flg	HYD (50)	
IAS	1-1/2	PVC	--	--	Sch 40	SW	N/A	IAS carrier piping
IAS	3/8	PVC Tubing	--	---	--	---	--	
IAS	1/2	Type 316 SS	--	--	--	---	--	
D	1-1/2	PVC	--	--	Sch 40	SW	HYD (50)	
CW	¾	C	--	I	--	Sd	HYD (100)	See Section 22 05 05
SPD	1-1/2, 2	PVC	--	--	Sch 40	SW	HYD (50)	

The following abbreviations are used in the Exposed Piping Schedule.

A. Service Abbreviations

Service	Abbrev.		Service	Abbrev.
Wastewater	WW		Sump Pump Discharge	SPD
Wastewater Suction	WWS		City Water (Potable Water)	CW
Wastewater Discharge	WWD		Drain	D
	IAS			

B. Material Abbreviations

Material	Abbrev		Material	Abbrev.
Ductile Iron	DI		Polyvinyl Chloride	PVC
Cast Iron	CI		Chlorinated Polyvinyl Chloride	CPVC
Carbon Steel	CS		Polyethylene	PE
Stainless Steel	SS		High Density Polyethylene	HDPE
Copper	C		Fiberglass Reinforced Plastic	FRP
Prestressed Concrete Cylinder Pipe	PCCP			
Non-Prestressed Concrete Cylinder Pipe	CCP			
Steel Cylinder Pipe	SCP			

C. Lining/Coating Abbreviations

Lining	Abbrev		Coating	Abbrev.
Cement Mortar Lined	CL		Painted	P
Glass Lined	GL		Insulated	I
Ceramic Epoxy	CE		Galvanized	Galv
Fusion Bonded Epoxy Lined	FBEL			
Plastic Lined	PL			

D. Joint Abbreviations

Joint Type	Abbrev		Joint Type	Abbrev.
Bell and Spigot	BS		Flanged	Flg
Restrained Bell and Spigot	RBS		Butt Weld	BW
Push-on Joint	POJ		Lap Weld	LW
Restrained Push-on Joint	RPOJ		Butt Fusion Weld	BFW

Mechanical Joint	MJ		Solvent Weld	SW
Restrained Mech. Joint	RMJ		Sleeve-type Flexible Coupling	SLFC
Soldered	Sd		Split Flexible Coupling	SPFC
Brazed	Bz		Plasticized PVC Coupling	PPVC
Threaded	Thd		Grooved or Shouldered End Coupling	GSEC
			Flanged Adapter	FA

E. Test Abbreviations

Test	**Abbrev**		**Test**	**Abbrev.**
Hydrostatic Test (test pressure in psig)	HYD ( )		Disinfection and Bacteriological Testing	DBT
Process Air Pipe Test (test pressure in psig)	PA ( )		Examination of Welds	EW
Chlorine Pipe Test	CL		Exfiltration Test	EX
			No Test Required	NR

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SECTION 40 05 06

COUPLINGS, ADAPTERS, AND SPECIALS FOR PROCESS PIPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install all couplings, adapters, and specials for process piping.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before couplings, adapters, and specials for process piping Work.

C. Related Sections:
   1. Section 09 91 00, Painting.
   2. Section 40 05 05, Exposed Piping Installation.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI B16.1, Cast-Iron Pipe Flanges and Flanged Fittings.
   2. ASTM A53/A53M, Specification for Pipe, Steel, Black and Hot-dipped, Zinc-Coated, Welded and Seamless.
   3. ASTM F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

1.3 QUALITY ASSURANCE

A . Qualifications:
   1. Manufacturer shall have at least five years experience producing substantial similar products to those specified and shall be able to provide documentation of at least five installations in satisfactory operation for at least five years each.

B. Component Supply and Compatibility:
   1. Obtain each type of coupling, adapter, and special for process piping product included in this Section, regardless of component manufacturer, from a single couplings, adapters, and specials manufacturer.
   2. Supplier shall prepare, or review, and approve all submittals for components furnished under this Section.
   3. Components shall be suitable for specified service conditions and be integrated into overall assembly by the Supplier.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Submit piping layout Shop Drawings in accordance with Section 40 05 05, Exposed Piping Installation.
   2. Product Data:
      a. Submit product data on each type of coupling, expansion joint, and other piping specialties and accessories, including gaskets, hardware, and appurtenances sufficient to demonstrate compliance with the Contract Documents.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. When requested by ENGINEER submit certificate attesting to compliance with standards referenced in this Section, signed by manufacturer.
   2. Manufacturer's Instructions:
      a. Provide instructions for handling, storing, installing, and adjusting of products.
   3. Source Quality Control:
      a. When requested by ENGINEER, submit results of source quality control tests.
   4. Qualifications Statements:
      a. Submit qualifications of manufacturer when requested by ENGINEER.

1.5 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 40 05 05, Exposed Piping Installation.

PART 2 – PRODUCTS

2.1 COUPLINGS

A. Sleeve-type, Flexible Couplings:
   1. Pressure and Service: Same as connected piping.
   2. Products and Manufacturers: Provide products of one of the following:
   3. Material: Ductile Iron.
   4. Gaskets: Suitable for specified service, as recommended by manufacturer.
   5. Bolts and Nuts: Alloy steel, corrosion-resistant, primer-coated. For buried or submerged applications, provide stainless steel bolts complete with washers complying with ASTM F593, AISI Type 316 and with nitrided stainless nuts.
   6. Harnessing:
      a. Harness couplings to restrain pressure piping. For pipelines that will be under pressure, test pressures are specified in piping schedules in Section 33 05 05, Buried Piping Installation, and Section 40 05 05, Exposed Piping Installation..

c. Conform to dimensions, size, spacing, and materials for lugs, bolts, washers, and nuts as recommended by manufacturer and approved by ENGINEER for pipe size, wall thickness, and test pressure required. Provide minimum 5/8-inch diameter bolts.

7. Remove pipe stop(s) if used, unless otherwise shown or specified.

B. Flanged Coupling Adapters:
1. Description: One end of adapter shall be flanged and opposite end shall have sleeve-type flexible coupling.
2. Products and Manufacturers: Provide one of the following:
a. Style 227, as manufactured by Dresser Piping Specialties, part of Dresser, Inc.
b. Style 912, by Smith Blair, Inc.
c. Or equal.
3. Pressure and Service: Same as connected piping.
4. Material: Ductile iron.
5. Gasket: Recommended by the manufacturer.
6. Bolts and Nuts: Alloy steel, corrosion-resistant, primer-coated. For buried or submerged applications, provide stainless steel bolts complete with washers complying with ASTM F593, AISI Type 316 and nitrided stainless nuts.
7. Harnessing:
a. Harness adapters to restrain pressure piping. For pressure pipelines, test pressures are included in piping schedules in Section 33 05 05, Buried Piping Installation, and Section 40 05 05, Exposed Piping Installation.
b. For flanged adapters 12-inch diameter and smaller, provide 1/2-inch diameter (minimum) Type 316 stainless steel anchor studs installed in pressure-tight anchor boss. For buried or submerged applications, provide external bolting and other hardware of Type 316 stainless steel, including tie bolts, bolt plates, lugs, nuts, and washers. Provide number of studs required to restrain test pressure and service conditions. Harness shall be as designed and recommended by flanged adapter manufacturer. Provide the following minimum anchor studs unless otherwise approved by ENGINEER.
1) Six-inch Diameter and Smaller: Two
2) Eight-inch Diameter and Smaller: Four
3) Ten-inch Diameter and Smaller: Six
4) Twelve-inch Diameter and Smaller: Eight
c. For adapters larger than 12-inch diameter, provide split-ring harness clamps with minimum of four corrosion-resistant alloy steel bolts. For buried or submerged applications, provide external bolting and other hardware of Type 316 stainless steel, including tie bolts, bolt plates, lugs, nuts, and washers. Harness assembly shall be as designed and recommended by flanged adapter manufacturer. Dimensions, sizes, spacing and materials shall be suitable for service and conditions encountered and shall be approved by ENGINEER.

C. Split-type Grooved or Shouldered End Couplings:

1. Pressure and Service: Same as connected piping. Use shouldered end where required by pressure rating.
2. Products and Manufacturers:
    a. For coupling of cast-iron or ductile iron pipe, provide products of one of the following:
        1) Style 31, as manufactured by Victaulic Company.
        2) Series 500, as manufactured by Tyler Pipe, Gustin Bacon Division.
        3) Gruvlok Figure 705, as manufactured by Grinnell Mechanical Products, division of Tyco.
        4) Or equal.
    b. For coupling of standard steel pipe, where joint deflection is desired or allowed, provide products of one of the following:
        1) Style 77, as manufactured by Victaulic Company.
        2) Series 1000, as manufactured by Tyler Pipe, Gustin Bacon Division.
        3) Or equal.
    c. For coupling of standard steel pipe, where joint deflection is not desired or allowed, provide products of one of the following:
        1) Style HP-70, as manufactured by Victaulic Company.
        2) Series 110, as manufactured Tyler Pipe, Gustin Bacon Division.
        3) Or equal.
    d. For coupling of stainless steel pipe, provide products of one of the following:
        1) Style 77-S, as manufactured by Victaulic Company.
        2) Or equal.
    e. For coupling of aluminum pipe, provide products of one of the following:
        1) Style 77A, as manufactured by Victaulic Company.
        2) Series 101, as manufactured by Tyler Pipe, Gustin Bacon Division.
        3) Or equal.
    f. For coupling of thermoplastic pipe, provide products of one of the following:
        1) Style 774, as manufactured by Victaulic Company.
        2) Or equal.
3. Couplings shall conform to applicable requirements of AWWA C606.
4. Housing Material:
    a. For coupling of cast-iron pipe, ductile iron pipe, steel pipe, and thermoplastic pipe: Malleable iron or ductile iron.
    b. For coupling of stainless steel pipe: Type 304 stainless steel, or equal.
    c. For coupling of aluminum pipe: Aluminum alloy 356-T6.
5. Gaskets: Recommended by the manufacturer.
6. Bolts and Nuts: Heat-treated carbon steel track bolts, plated. For buried or submerged applications, provide stainless steel bolts complete with washers complying with ASTM F593, AISI Type 316 and with nitrided stainless nuts.

2.3 MISCELLANEOUS SPECIALTIES AND ACCESSORIES

A. Dielectric Connections:
    1. General: Where copper pipe connects to steel pipe, cast-iron pipe, or ductile iron pipe, provide either dielectric union or an insulating section of rubber or

plastic pipe. When used, insulating section shall have minimum length of 12 pipe diameters.

2. Manufacturers: Provide products of one of the following:
   a. Epco Sales, Inc.
   b. Watts Regulator Company.
   c. Capitol Manufacturing Company.
   d. Or equal.
3. Dielectcric Unions: Rated for 250 psi, ANSI B16.39.
4. Insulating Sections: Rated for same pressure as associated piping test pressure. Material shall be suitable for the application and service.

2.4 PAINTING

A. Shop Painting:
   1. Clean and prime-coat ferrous metal surfaces of products in the manufacturer's shop in accordance with Section 09 91 00, Painting, unless otherwise specified in this Section
   2. Coat machined, polished and non-ferrous surfaces bearing surfaces and similar unpainted surfaces with corrosion prevention compound that shall be maintained during storage and until products are placed into operation.

B. Field painting shall conform to Section 09 91 00, Painting.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect materials for defects in material and workmanship. Verify compatibility of products with pipe, fittings, valves, and appurtenances.

3.2 INSTALLATION

A. Installation:
   1. Install piping specialties in accordance with the Contract Documents and manufacturer's instructions.
   2. For exposed installations, refer to Section 40 05 05, Exposed Piping Installation.

B. Adjust expansion joints as required to ensure that expansion joints will be fully extended when ambient temperature is at minimum operating temperature, and fully compressed at maximum operating temperature for the system in which expansion joints are installed.

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SECTION 40 05 07

PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified and required to design, furnish, and install all hangers, supports and appurtenances necessary to complete the Work.

B. Coordination:
   1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with the pipe hangers and supports Work.

C. Related Sections:
   1. Section 03 00 05, Concrete.
   2. Section 05 05 33, Anchor Systems.
   3. Section 09 91 00, Painting.
   4. Section 40 05 06, Couplers, Adapters, and Specials for Process Piping.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American Society for Testing and Materials, (ASTM).
      a. ASTM A 575, Specification for Steel Bars Carbon, Merchant Quality, M-Grades.
      b. ASTM E 84, Test Method for Surface Burning Characteristics of Building Materials.
   2. Federal Specification, (FS).
      a. FS A-A-1192, Hangers, Pipe.
   3. Manufacturers Standardization Society of the Valve and Fittings Industry, (MSS).
      a. MSS SP 58, Pipe Hangers and Supports-Materials, Design and Manufacture.
      b. MSS SP 69, Pipe Hangers and Supports - Selection and Application.
   4. Underwriters' Laboratories, Inc., (UL).
      a. UL 203, Pipe Hanger Equipment for Fire Protection Service.

1.3 QUALITY ASSURANCE

A. Each type of pipe hanger or support shall be the product of one manufacturer.

B. Component Supply and Compatibility:

1. Obtain all equipment included in this Section regardless of the component manufacturer from a single pipe hangers and supports manufacturer.
2. The pipe hangers and supports equipment manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the pipe hangers and supports equipment manufacturer.

C. Professional Engineer:
   1. Engage a registered professional engineer legally qualified to practice in New York State and experienced in providing engineering services of the kind indicated.
   2. Submit qualifications data.
   3. Responsibilities include but are not necessarily limited to:
      a. Carefully reviewing system performance and design criteria stated in the Contract Documents.
      b. Preparing written requests for clarifications or interpretations of performance or design criteria for submittal to Engineer by Contractor.
      c. Preparing or supervising the preparation of design calculations and related drawings, Shop Drawings, testing plan development, test-result interpretation and a comprehensive engineering analysis verifying compliance of the system with the requirements of the Contract Documents.
      d. Signing and sealing all calculations and design drawings, and Shop Drawings.
      e. Certifying that:
         1) it has performed the design of the system in accordance with the performance and design criteria stated in the Contract Documents, and
         2) the said design conforms to all applicable local, state and federal codes, rules and regulations, and to the prevailing standards of practice.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Detailed drawings showing all hangers and supports for each piping system specified. Shop Drawings shall show location, installation, material, loads or forces, and deflection of all hangers and supports.
      b. Each pipe system shall be analyzed for all loads and forces on the hangers and supports. Provide calculations of reaction forces to the structure to which they are fastened. Provide confirmation that hanger systems comply with support requirements and codes.
      c. Submit and coordinate these with Shop Drawings required for all piping systems.

2. Product Data:
    a. Manufacturers' catalogs, literature, and engineering data on all hangers and supports. Load ratings, materials and installation shall be consistent with the recommendations of the MSS SP 58, MSS SP 69 and Federal Specification A-A-1192.

3. Delegated Design Submittals:
    a. 1/4-inch scale piping, and equipment layouts, dimensioned to show length of runs, anchors and appurtenances required for proper control of piping and equipment forces. The drawings shall include all forces acting on the piping and equipment and the corresponding reactions of the compensation and anchor devices provided.
    b. All drawings, design calculations, and a letter indicating that the hanger and support systems have been properly designed shall be signed and sealed by a registered professional engineer legally qualified to practice in New York State.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
    1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.

B. Storage and Protection:
    1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
    2. Store materials in covered storage off the ground and prevent condensation.

C. Acceptance at Site:
    1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 GENERAL

A. Hangers and supports, where shown, shall be in accordance with detail drawings. Hangers and supports not shown shall be in accordance with MSS SP 58.

B. Hangers and supports shall meet with the following requirements:

1. Standard and fabricated hangers and supports shall be furnished complete with necessary inserts, bolts, nuts, rods, washers, and other accessories.
2. Generally, run piping in groups where practicable and parallel to building wall. Provide minimum clearance of 1-inch between pipe and other work.
3. Install hangers or supports at all locations where pipe changes direction.
4. All hangers and supports shall be capable of adjustment after placement of piping.
5. Different types of hangers or supports shall be kept to a minimum.
6. All suspended or supported ductile iron pipe shall have a hanger or support adjacent to each hub.
7. Support vertical piping at each floor and between floors by stays or braces to prevent rattling and vibration.
8. Hanger rods shall be straight and vertical. Chain, wire, strap or perforated bar hangers shall not be used. Hangers shall not be suspended from piping.
9. Maximum support spacing unless otherwise shown or approved for standard weight steel pipe shall be as follows:

Pipe Size (inches)	Maximum Pipe Span [1] (feet)			
	Steel	Copper	Plastic [2]	Cast/Ductile Iron [4]
3/8 to 3/4	5	6	Cont. [3]	-
1	6	6	5	-
1-1/4	6	6	5	-
1-1/2	6	6	5	-
2	10	10	5	-
2-1/2	10	10	5	-
3	10	10	5	-
4	12	12	5	12 feet for pressure pipe
6	12	12	5	
8	12	12	5	
10	12	-	5	
12	12	-	10	
14	12	-	-	
16	12	-	-	
18	12	-	-	10 feet for soil pipe
20	12	-	-	
24	12	-	-	

[1]Pipe shall not have pockets formed in the span due to sagging of the pipe between supports caused by the weight of the pipe, medium in the pipe, insulation, valves and fittings.

[2]Span shown is for Schedule 80 CPVC pipe at 100°F. Spans for other plastics, other CPVC pipe Schedules and pipes at higher temperatures shall be shortened in accordance with the pipe manufacturer's recommendations.

[3]Continuous means pipe shall be in unistrut or similar channel.

[4] Pipe hanger and support selection shall be as shown and in this Section.

10. Maximum support spacing, unless otherwise shown for plastic pipe at ambient temperature, shall be one-half of the values specified for steel pipe.
11. Plastic pipe at temperature greater than 130ºF shall be continuously supported in a metal cradle or tray.
12. Where proper hanger or support spacing does not correspond with joist or rib spacing, structural steel channels may be attached to joists or ribs and pipes suspended there from.
13. Prevent contact between dissimilar metals when supporting copper tubing, by use of copper plated, rubber or vinyl coated, or stainless steel hangers or supports.
14. Isolate thin walled stainless steel piping from carbon steel by use of plastic coated hangers or supports or by taping at points of contact with PVC or vinyl.
15. Supports and hangers shall be of a material that is compatible with the fluid being conveyed in such pipe being supported.
16. Anchors for pipe support systems shall be compatible or protected by a coating system which is compatible with the fluid being conveyed in such pipe being supported.

B. Expansion compensation shall be designed for individual exposed piping systems with the following Design Criteria:
1. $\Delta L = L \times \Delta T \times \alpha$
   a. Where ΔL = pipe length change (inches).
   b. L = pipe length between anchors (inches).
   c. ΔT = 100 (F).
   d. α = coefficient of thermal expansion (inches/inches/F).
2. Expansion compensation shall be designed as an integral part of the piping hanger, support and anchorage system.
3. Expansion compensation shall be achieved via expansion joints specified in Section 40 05 06, Couplers, Adapters, and Specials for Process Piping.

2.2 MANUFACTURERS

A. Manufacturers: Provide one of the following:
1. Anvil International, Inc.
2. Elcen.
3. B-Line.
4. Unistrut Corporation.
5. Or-equal.

2.3 HANGERS AND SUPPORTS

A. Materials:
1. Hangers, supports, restraints, and appurtenances located in wet areas shall be Type 316 stainless steel.

2. Hangers, supports, restraints, and appurtenances located in non-corrosive or dusty areas shall be hot dipped galvanized steel in accordance with ASTM A123/A123M and ASTM A153/A153M.
3. Hangers, supports, restraints, and appurtenances located outdoors shall be Type 316 stainless steel.
4. Steel used for the support of uninsulated copper piping or plastic piping shall be PVC coated.

B. Hanger Attachment and Accessories: The following types of attachments shall be considered acceptable:
1. Hanger Rods – ASTM A575, with square head nut on top and running thread on bottom end.
2. Concrete Inserts – MSS SP 58 malleable Type 18. Concrete inserts shall be of the continuous type capable of supporting the required load in pounds per foot of insert.
3. Adjustable Pipe Stanchion Saddle – MSS SP 58 Type 38.
4. Adjustable Clevis Hanger – MSS SP 58 Type 1.
5. Steel Beam Clamps – MSS SP 58 malleable Type 4.
6. U-Bolts – MSS SP-58 Type 24.
7. Brackets – MSS SP-58 Type 33.
8. Insulated Pipe Inserts:
   a. Insulated pipe, larger than 1-1/2-inches in diameter, shall be supported by a rigid insert to protect the insulation. A steel metal saddle of sufficient gauge to carry the weight of the pipe and its fluid without deforming shall extend 2-inches minimum on each side of the rigid insert. The joints between insert and insulation shall be sealed before saddle is installed.
   b. Sizes up to 6-inches IPS shall be MSS SP 58, Type 40.
   c. Sizes over 10-inches shall be MSS SP 58, Type 39.

2.4 PAINTING

A. Clean and prime ferrous metal surfaces in the shop in accordance with the requirements of Section 09 91 00, Painting.

B. Field painting shall conform to the requirements of Section 09 91 00, Painting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Locate hangers, supports, and accessories to support piping, valves, and at all concentrated loads.

B. Locate hangers, supports, and accessories within maximum span lengths specified to support continuous pipeline runs unaffected by concentrated loadings.

C. Locate hanger, supports to prevent vibration or swaying and to provide for expansion and contraction.
   1. Temperature differential specified in this Section.
   2. Support piping independently so that equipment is not stressed by piping weight or expansion.
   3. For Uninsulated Copper Pipe or Tubing: Clamps and supports, electroplated copper finish. Instrumentation tubing shall be supported in steel or aluminum troughs with covers. All tubing layout and connections shall be as approved by the manufacturer of the equipment.
   4. Uncoated Hangers, Rods and Supports: Dip in zinc chromate primer before installation.
   5. Maximum spacing for horizontal piping:
      a. Steel 1-Inch and Smaller: Seven feet.
      b. Steel 1-1/2-Inch and Larger: Ten feet.
      c. Brass or Copper 3-Inch and Smaller: Seven feet.
      d. Brass or Copper 4-Inch and Larger: Ten feet.
      e. Additional supports at:
         1) Change in direction.
         2) Branch piping and runouts over five feet.
         3) Concentrated loads due to valves, strainers or other similar items.
      f. Maximum support spacing for plastic pipe at ambient temperature shall be one-half the above values.
   6. Hanger types for horizontal piping, except as noted and shown:
      a. Forged steel adjustable clevis type, rod support for all services.
      b. Slide Bases:
         1) Pipe stand, brackets, trapeze or other equivalent structural support.
         2) For piping 2-inches or larger.
      c. For pipe and covering provide:
         1) Saddles for rollers or slide bases.
         2) Protective shields or saddles for all other types of supports.
      d. Threaded Steel Rods:
         1) Two inch vertical adjustment with two nuts each end for positioning and locking.
         2) Size hanger rods according to the schedule below, unless otherwise noted:

Nominal Pipe (Inches)	Rod Diameter (Inches)
2 and less	3/8
2-1/2 to 3-1/2	1/2
4	5/8
6	3/4
8 through 12	7/8
14 through 18	1
20 through 30	1-1/4

         3) For Double Rod Hangers: One size smaller than above.

4) Connection to Structure for Piping to 2-Inches: Concrete inserts, or expansion shields in shear into sides of beams.
5) Connection to Structure for Piping 2-1/2-Inch or Larger: Concrete inserts, beam clamps or suitable bridging.

7. Vertical Piping:
   a. Base Support: Base elbow or welded equivalent.
      1) Bearing plate on structural support.
   b. Guides not to exceed:
      1) 25 feet for piping to 2-inches.
      2) 36 feet for piping 2-1/2-inches or larger.
   c. Top Support:
      1) Special hanger or saddle in horizontal connection.
      2) Provisions for expansion.
   d. Intermediate Supports: Steel pipe clamp at floor.
      1) Bolted and welded to pipe.
      2) Extension ends bearing on structural steel or bearing plates.
   e. For Multiple Pipes: Coordinate guides, bearing plates and accessory steel. Insulated Piping:
   a. Horizontal Pipe Shields at Supports:
      1) Minimum 120 degree arc.
      2) Length equal to diameter of insulation 12-inch minimum.
      3) To 6-Inch Pipe Size: No. 18 USSG galvanized steel.
   b. Vertical Pipe Shields at Guides:
      1) Full 360 degree arc, securely banded.
      2) Length equal to diameter of insulation, 12-inch minimum.
      3) To 6-Inch Pipe Size: No. 18 USSG galvanized steel.

D. Install items to be embedded before concrete placement.

E. Fasten embedded items securely to prevent movement during concrete placement.

F. Install hangers and support units on piping systems in accordance with manufacturer's recommendations.

G. Adjust hangers and supports and place grout for concrete supports to bring pipelines to specified elevations.

H. Bring all pipe systems up to operating pressures and temperatures. Cycle systems to duplicate operating conditions. Correct all support malfunctions.

+ + END OF SECTION + +

SECTION 40 05 08

WALL PIPES, FLOOR PIPES, AND PIPE SLEEVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all floor pipes, pipe sleeves, wall pipes, other wall pieces, and escutcheons to complete the Work.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate with the installation of floor pipes, pipe sleeves, wall pipes, other wall pieces and escutcheons that must be installed with or within formwork, walls, partitions, ceilings and panels.

C. Related Sections:
   1. Section 07 92 00, Joint Sealants.
   2. Section 40 05 05, Exposed Piping Installation.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American National Standards Institute, (ANSI).
      a. ANSI B16.1, Cast-Iron Pipe Flanges and Flanged Fittings.
      b. ANSI B16.4, Gray-Iron Threaded Fittings.
   2. American Water Works Association, (AWWA).
      a. AWWA C104 (ANSI A21.4), Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
      b. AWWA C110 (ANSI A21.10), Ductile-Iron and Gray-Iron Fittings, for Water.
      c. AWWA C111 (ANSI A21.11), Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
      d. AWWA C115 (ANSI A21.15), Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
      e. AWWA C151 (ANSI A21.51), Ductile-Iron Pipe, Centrifugally Cast, for Water.

1.3 QUALITY ASSURANCE

A. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single wall pipes, floor pipes and pipe sleeves manufacturer.

2. The wall pipes, floor pipes and pipe sleeves manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the wall pipes, floor pipes and pipe sleeves manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Detailed drawings and data on all wall and floor pipe, and pipe sleeves. Submit and coordinate these with Shop Drawings required for all piping systems.

1.5 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements of Section 40 05 05, Exposed Piping Installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Wall and Floor Pipes:
   1. Material: Same as specified for the piping connected to wall or floor pipe, unless otherwise approved by ENGINEER.
   2. End Connections: As shown.
   3. Thickness: Same as specified for the piping connected to wall or floor pipe.
   4. Collars: Provide collars at mid-point of wall for anchorage and watertightness.
   5. Pipes ends shall be flush with wall face, unless otherwise shown.
   6. Drill and tap flanged ends and mechanical joint bells for studs. Provide studs of same material as connected piping, except submerged and buried studs shall be of Type 316 stainless steel.

B. Pipe Sleeves:
   1. Ferrous and Plastic Pipe: Use standard weight galvanized steel pipe, unless otherwise shown.
   2. Copper Pipe: Use Type K hard drawn copper pipe, unless otherwise shown.

C. Cast Wall Sleeves:
   1. Material: Ductile iron furnished with integral wall collar.
   2. Dimensions: As required for mechanical joint pipe to pass through sleeve. Length as required.

D. Link Seals: Provide link type mechanical seals suitable for 20 psi working pressure, corrosive service and accessible from one side, with glass-reinforced nylon pressure plate and stainless steel bolts and nuts.
   1. Products and Manufacturers: Provide one of the following:
      a. Link-Seal, as manufactured by Thunderline Corporation.
      b. Or equal.

E. Wall and Ceiling Plates:
   1. Bare pipes passing through walls and ceilings in finished rooms: Provide escutcheon plates of cast brass or cast-iron nickel plated, clevis or split ring and hinged with set screws.
   2. Provide plated escutcheon plates of 18-gauge steel for insulated pipes passing through walls and ceilings in finished rooms.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wall and Floor Pipes: Install as shown and in accordance with approved Shop Drawings.

B. Pipe Sleeves:
   1. Use sleeves wherever pipes pass through walls, partitions, floors, and roofs, unless otherwise shown.
   2. Extend all sleeves through floor slabs a minimum of 2-inches above finished floor.
   3. Anchor sleeves to concrete and masonry walls as shown or otherwise approved.
   4. All sleeves through walls shall be flush with wall face.
   5. All pipe joints and annular spaces in exterior walls or walls subjected to hydrostatic pressure shall be completely watertight.
   6. Use link type seals to seal sleeve against hydrostatic pressure. Size sleeves to provide annular space required to suit the link type mechanical seals that are used.
   7. Do not install sleeves and pipes through structural members, unless specifically shown and approved by ENGINEER.
   8. Size sleeves to provide annular space as follows:

Pipe Size	Sleeve ID Minus Pipe Or Insulation OD
Less than 2-inches	1/2-inches to 3/4-inches
2-inches to 4-inches	3/4 inches to 1-1/4-inches.
6-inches to 12-inches	1-1/4 inches to 2-inches
Over 12-inches	2-inches to 3-inches

C. Install wall and ceiling plates in accordance with the manufacturer's recommendations and approved Shop Drawings.

+ + END OF SECTION + +

SECTION 40 05 19

DUCTILE IRON PROCESS PIPE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish ductile iron pipe and fittings.
   2. Extent of piping is shown on the Drawings. Piping schedules in Section 40 05 05, Exposed Piping Installation, specify pipe service, diameter, material, lining, coating, pressure rating, joint type, and testing required.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before ductile iron pipe Work.

C. Related Sections:
   1. Section 31 20 00, Earth Moving. .
   2. Section 09 91 00, Painting.
   3. Section 40 05 05, Exposed Piping Installation.
   4. Section 40 05 06, Couplers, Adapters, and Specials for Process Piping.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI B18.2.1, Square and Hex Bolts and Screws Inch Series.
   2. ANSI B18.2.2, Square and Hex Nuts. (Inch Series).
   3. ASTM A193, Alloy Steel and Stainless Steel Bolting Materials for High-Temperature Service.
   4. ASTM A194, Specification for Carbon Steel and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
   5. ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
   6. ASTM A354, Specification for Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners.
   7. ASTM A563, Specification for Carbon and Alloy Steel Nuts.
   8. ASTM B117, Practice for Operating Salt Spray (Fog) Apparatus.
   9. ASTM C283, Test Methods for Resistance of Porcelain Enameled Utensils to Boiling Acid.
   10. ASTM D714, Test Method for Evaluating Degree of Blistering of Paints.
   11. ASTM D792, Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
   12. ASTM D5162, Discontinuity (Holiday) Testing of Non-Conductive Protective Coating on Metallic Substrates.
   13. ASTM E96, Test Methods for Water Vapor Transmission of Materials.

14. ASTM G14, Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test).
15. ASTM G62, Test Methods for Holiday Detection in Pipeline Coatings.
16. ASTM G95, Test Methods for Cathodic Disbondment Test of Pipeline Coatings (Attached Cell Method).
17. ANSI/AWWA C104, Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
18. ANSI/AWWA C110, Ductile Iron and Gray Iron Fittings for Water.
19. ANSI/AWWA C111, Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
20. ANSI/AWWA C115, Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges.
21. ANSI/AWWA C116, Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile Iron and Gray Iron Fittings for Water Service.
22. ANSI/AWWA C151, Ductile Iron Pipe, Centrifugally Cast, for Water.
23. ANSI/AWWA C153, Ductile Iron Compact Fittings, 3 inch through 24 inch and 54 inch through 64 inch for Water Service.
24. ANSI/AWWA C606, Grooved and Shouldered Type Joints.
25. European Standard (EN), EN 598: Ductile Iron Pipe, Fittings, Accessories and Their Joints for Sewerage Applications.
26. MSS-SP 60, Connecting Flange Joint Between Tapping Sleeves and Tapping Valves.
27. NACE RP0188, Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
28. NAPF 500-03, Surface Preparation Standard for Ductile Iron Pipe and Fittings Receiving Special External Coatings and/or Special Internal Linings.
29. NSF/ANSI 61, Drinking Water System Components - Health Effects.
30. SSPC PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
31. SSPC Painting Manual, Volume 1, Para. XIV.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer:
      a. Manufacturer shall have a minimum of five years successful experience producing ductile iron pipe and fittings and shall be able to show evidence of at least five installations in satisfactory operation in the United States that are similar applications to the specified service.
      b. Lining and coating products shall be manufactured by a firm with a minimum of five years successful experience in protecting pipelines exposed to the specified service conditions, and shall be able to show evidence of at least five installations in satisfactory operation in the United States that are similar applications to the specified service.
      c. When not applied by the manufacturer, lining and coating Subcontractor shall have a minimum of five years successful experience in the application of the specified linings and coatings

for similar applications for the specified service, and shall be able to show evidence of at least five installations in satisfactory operation in the United States.

B. Supply and Compatibility:
   1. Unless otherwise approved, obtain all pipe, fittings, and appurtenances included in this Section from a single ductile iron pipe manufacturer.
   2. Ductile iron pipe manufacturer shall review and approve or prepare all Shop Drawings and other submittals for pipe, fittings, and appurtenances furnished under this Section.
   3. Pipe, fittings, and appurtenances shall be suitable for the specified service and shall be integrated into overall piping system by ductile iron pipe manufacturer.
   4. Ductile iron pipe manufacturer shall be responsible for all products and all factory-applied linings and coatings, whether installed at pipe manufacturer's facility or at manufacturer's Supplier's facility.

1.4 SUBMITTALS

A. Action Submittals: Submit the following with Shop Drawings required under Section 40 05 05, Exposed Piping Installation:
   1. Shop Drawings:
      a. Detailed drawings and data for pipe, fittings, gaskets, appurtenances, linings, and coatings.
   2. Product Data:
      a. Product data on pipe, fittings, gaskets, hardware, and appurtenances sufficient to demonstrate compliance with the Contract Documents.
      b. Surface preparation and application reports and procedures as required for lining and coating of pipe and fittings. Ductile iron pipe and fitting manufacturer and manufacturer and applicator of lining and coating, as specified, shall mutually determine recommended surface preparation and application methods, and provide written verification of mutually selected method in the submittals.
   3. Test Procedures: For linings and coatings in pipe and fittings.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Submit certificate signed by manufacturer of each product that product conforms to applicable referenced standards and the Contract Documents.
   2. Source Quality Control Submittals:
      a. Submit results of specified shop tests for pipe, fittings, linings, and coatings.
      b. Lining and coating test coupons.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 40 05 05, Exposed Piping Installation.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General:
   1. Piping systems shall be suitable for their intended use.
   2. Joints shall be as specified in Section 40 05 05, Exposed Piping Installation. If not specified, provide flanged joints for exposed piping and mechanical joints for buried piping. Provide couplings on pipe with plain or grooved ends where shown or where approved by ENGINEER.

B. Ductile Iron Pipe, Joints, and Fittings:
   1. Flanged Pipe: Fabricate in accordance with ANSI/AWWA C115.
      a. Pressure Rating: As specified in piping schedule in Section 40 05 05, Exposed Piping Installation. If not otherwise specified, use Special Thickness Class 53 for three-inch to 54-inch diameter pipe and Pressure Class 350 for 60-inch and 64-inch diameter pipe.
   2. Non-Flanged Pipe: Conform to ANSI/AWWA C151 for material, pressure, dimensions, tolerances, tests, markings, and other requirements.
      a. Pressure Class: As specified in piping schedules in Section 33 05 05, Buried Piping Installation and Section 40 05 05, Exposed Piping Installation. If not otherwise specified, use Pressure Class 53.
      b. Special Thickness Class: As specified in piping schedules in Section 33 05 05, Buried Piping Installation and Section 40 05 05, Exposed Piping Installation.
   3. Pipe Joints:
      a. Flanged Joints: Conform to ANSI/AWWA C110 and ANSI/AWWA C111 capable of meeting the pressure rating or special thickness class, and test pressure specified in piping schedule in Section 40 05 05, Exposed Piping Installation.
         1) Gaskets: Unless otherwise specified, gaskets shall be at least 1/8-inch thick, ring or full-face as required for the pipe, of synthetic rubber compound containing not less than 50 percent by volume nitrile or neoprene, and shall be free from factice, reclaimed rubber, and other deleterious substances. Gaskets shall be suitable for the service conditions specified, specifically designed for use with ductile iron pipe and fittings.
         2) Bolts: Comply with ANSI B18.2.1.
            a) Exposed: ASTM A307, Grade B.
            b) Buried or Submerged: ASTM A193, Grade B8M, Class 2, Heavy hex, Type 316 stainless steel.
         3) Nuts: Comply with ANSI B18.2.2.
            a) Exposed: ASTM A563, Grade A, Heavy hex.
            b) Buried or Submerged: ASTM A194, Grade B8M, Heavy hex, Type 316 stainless steel.
      b. Mechanical Joints: Comply with ANSI/AWWA C111 and

ANSI/AWWA C151, capable of meeting pressure rating or special thickness class, and test pressure specified in piping schedules in Section 33 05 05, Buried Piping Installation, and Section 40 05 05, Exposed Piping Installation.

1) Glands: Ductile iron.
2) Gaskets: Plain tip.
3) Bolts and Nuts: High strength, low alloy steel.
4) Manufacturers: Provide products of one of the following:
   a) Clow Water Systems Company
   b) Atlantic States Cast Iron Pipe Company
   c) Canada Pipe Company, Ltd.
   d) McWane Cast Iron Pipe Company
   e) Pacific States Cast Iron Pipe Company
   f) Griffin Pipe Products Co.
   g) American Cast Iron Pipe Co.
   h) U.S. Pipe and Foundry Co.
   i) Or equal.

4. Flanged and Push-On Joint Fittings: Comply with ANSI/AWWA C110 and ANSI/AWWA C111.
   a. Material: Ductile iron.
   b. Pressure rating, gaskets, bolts, and nuts shall be as specified for flanged joints. Pressure rating of fittings shall meet, but not exceed, specified pressure rating or special thickness class of the connected pipe.
5. Mechanical Joint Fittings: Comply with ANSI/AWWA C110 and ANSI/AWWA C111.
   a. Material: Ductile iron.
   b. Glands: Ductile iron.
   c. Pressure rating, gaskets, bolts, and nuts shall be as specified for mechanical joints. Pressure rating of fittings shall meet, but not exceed, specified pressure rating or special thickness class of connected pipe.

C. Lining, General:
1. Typical Service Conditions:

Property	Pump Station
Fluid(s) Conveyed Through Pipe	Wastewater
pH range	6-7
Temperature Range (degrees F)	35 to 80
Maximum Fluid Velocity (fps)	15
Lining Type	Cement-mortar

2. Surface Preparation:
   a. Initial Surface Inspection: Surface to be lined shall be inspected by pipe and fitting manufacturer and applicator, if applicator is other than pipe and fitting manufacturer. Inspecting parties shall inspect surface to be coated and mutually determine recommended surface preparation method.
   b. Surface Preparation: Prepare surface in accordance with

recommended method.

c. Finished Surface Inspection: Lining applicator shall inspect finished surface prior to application to determine acceptability. If surface is unacceptable, repeat surface preparation as necessary.

D. Cement-mortar Lining:
   1. Where specified in piping schedules included with Section 33 05 05, Buried Piping Installation and Section 40 05 05, Exposed Piping Installation, pipe and fittings shall be lined with bituminous seal coated cement-mortar lining in accordance with ANSI/AWWA C104.

E. Couplings:
   1. Refer to Section 40 05 06, Couplings, Adapters, and Specials for Process Piping.

F. Specials:
   1. Transition Pieces:
      a. Provide suitable transition pieces (adapters) for connecting to existing piping.
      b. Unless otherwise shown or indicated, expose existing piping to determine material, dimensions, and other data required for transition pieces.
   2. Taps:
      a. Provide taps where shown or required for small-diameter piping or instrumentation connections.
      b. Provide corporation stops where shown or required.
      c. Where pipe wall thickness or tap diameter will not allow engagement of the minimum number full of threads as recommended by the manufacturer, provide tapping saddle with outlet joints conforming to requirements of Paragraph 2.1.B.3.a of this Section for four-inch through 12-inch diameter pipe, and Paragraph 2.1.B.3.b. for 14-inch through 54-inch diameter pipe.
      d. For flanged connections on tapping saddle outlet branch, counterbore flange in accordance with MSS SP-60 dimensions. Inside diameter of outlet shall be 1/4-inch greater than nominal diameter.
   3. Tangential Outlets:
      a. Provide tangential outlet fittings where shown or indicated.

2.2 MARKING FOR IDENTIFICATION

A. In addition to identification markings specified in Section 40 05 05, Exposed Piping Installation, also stamp, mark, and identify push-on joint and mechanical joint pipe with:
   1. Name or trademark of manufacturer.
   2. Weight, class or nominal thickness, and casting period.
   3. Country where cast.
   4. Year the pipe was produced.
   5. Letters “DI” or “Ductile” shall be cast or metal stamped

B. In addition to identification markings specified in Section 40 05 05, Exposed Piping Installation, also stamp, mark, and identify flanged pipe with:
   1. Flange manufacturer's mark, size, and letters "DI" cast or stamped on the flanges.
   2. Fabricator's mark if other than flange manufacturer.
   3. Length and weight.

C. In addition to identification markings specified Section 40 05 05, Exposed Piping Installation, also stamp, mark, and identify fittings with:
   1. Manufacturer's identification.
   2. Pressure rating.
   3. Nominal diameters of openings.
   4. Country where cast.
   5. Number of degrees or fraction of the circle on bends.
   6. Letters "DI" or "Ductile" cast on them.

2.3 EXTERIOR SURFACE PREPARATION AND COATINGS

A. General Coating Requirements:
   1. Coating types are specified in piping schedules in Section 40 05 05, Exposed Piping Installation.

B. Exposed Pipe and Fittings:
   1. Surface Preparation:
      a. Initial Surface Inspection: Pipe and fitting manufacturer and coating applicator shall inspect surface to be coated and mutually determine recommended NAPF 500-03 surface preparation method.
      b. Surface Preparation: Prepare surface in accordance with recommended NAPF 500-03 method.
      c. Finished Surface Inspection: Prepared surfaces shall be inspected by coating applicator prior to application to determine acceptability of finished surface. If surface is unacceptable, repeat surface preparation and re-application as necessary.
   2. After recommended surface preparation, prime coat exterior ferrous metal surfaces of pipe and fittings in the shop in accordance with Section 09 91 00, Painting.
   3. Field painting shall comply with Section 09 91 00, Painting.

C. Buried Pipe and Fittings:
   1. Asphaltic Coating: Coat pipe and fittings with an asphaltic coating approximately one-mil thick, in accordance with ANSI/AWWA C151, ANSI/AWWA C115, ANSI/AWWA C110, and ANSI/AWWA C153, as applicable.

PART 3 – EXECUTION

3.1 INSPECTION

A. Inspect piping to assure that piping is free from defects in material and workmanship. Verify compatibility of pipe, fittings, gaskets, linings, and coatings.

3.2 INSTALLATION AND FIELD QUALITY CONTROL

A. For exposed piping installation and testing, refer to Section 40 05 05, Exposed Piping Installation.

+ + END OF SECTION + +

SECTION 40 05 31

THERMOPLASTIC PROCESS PIPE

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install thermoplastic piping and fittings.
   2. Extent of piping is shown and shall be in accordance with piping Section 40 05 05, Exposed Piping Installation.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items to be installed with or before thermoplastic piping Work.

C. Related Sections:
   1. Section 40 05 05, Exposed Piping Installation.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ASTM D1784, Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
   2. ASTM D1785, Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
   3. ASTM D2466, Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
   4. ASTM D3034, Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   5. ASTM D3212, Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
   6. ASTM D3311, Specification for Drain, Waste and Vent (DWV) Plastic Fittings Patterns.
   7. ASTM F477, Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
   8. ASTM F1336, Specification for Poly (Vinyl Chloride) (PVC) Gasketed Sewer Fittings.
   9. ASTM F1674, Standard Test Method for Joint Restraint Products for Use with PVC Pipe.
   10. ASTM F1760, Specification for Coextruded Poly (Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content.

11. AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In.-12 In. (100 mm-300 mm), for Water Transmission and Distribution
12. NSF 14, Plastic Piping Systems Components and Related Material.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: Shall have a minimum of five years experience producing thermoplastic pipe and fittings substantively similar to the materials specified, and shall be able to submit documentation of satisfactory service in at least five completed installations in operation for at least five years each.
   2. Installer:
      a. Engage a single pipe installer who shall be responsible for all thermoplastic pipe Work, and who shall employ only tradesmen with specific skills and experience in the type of Work required.
      b. Installer shall have a minimum of five years experience installing thermoplastic pipe and fittings substantively similar to the materials specified and substantively similar to or larger than the scope of thermoplastic piping Work on the Project, and shall be able to submit documentation of satisfactory experience in at least five completed installations in operation for at least five years each.

B. Component Supply and Compatibility:
   1. Obtain all materials included in this Section, regardless of component Supplier, from a single thermoplastic pipe Supplier. All pipe of each material type shall be furnished by the same manufacturer.
   2. Thermoplastic pipe Supplier shall review and approve to prepare all Shop Drawings and other submittals for all materials furnished under this Section.
   3. Materials shall be suitable for specified service conditions and shall be integrated into overall assembly by thermoplastic pipe Supplier.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Submit piping layout Shop Drawings in accordance with Section 40 05 05, Exposed Piping Installation.
   2. Product Data:
      a. Submit product data on pipe, fittings, gaskets, hardware, and appurtenances sufficient to demonstrate compliance with the Contract Documents.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Submit manufacturer’s certificate of compliance standards referenced in this Section.
   2. Source Quality Control Submittals:

a. When requested by ENGINEER, submit results of source quality control tests.

3. Qualifications Statements:
   a. Submit qualifications of manufacturer when requested by ENGINEER.
   b. Submit qualifications of installer when requested by ENGINEER.

1.5 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 40 05 05, Exposed Piping Installation.

PART 2 – PRODUCTS

2.1 SERVICE CONDITIONS

A. General:
   1. Pipe materials shall be suitable for services intended. Refer to piping schedules in Section 40 05 05, Exposed Piping Installation.
   2. Pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, and other defects. Unless otherwise shown or indicated, pipe shall be uniform in color, opacity, density, and other physical properties.
   3. Comply with NSF 14.
   4. Buried pipe shall be capable of withstanding external live load, including impact, equal to AASHTO H-20 loading, with cover shown or indicated on the Drawings.

2.2 POLYVINYL CHLORIDE (PVC) PIPING

A. PVC Pipe – General Applications: Unless otherwise shown or indicated, PVC pipe shall comply with the following:
   1. Manufacturers: Provide products of one of the following:
      a. Ipex, Inc.
      b. Spears Manufacturing Company.
      c. Or equal.
   2. Material: Unless otherwise specified, comply with the following:
      a. Type and Grade: Type 1, Grade 1.
      b. Wall Thickness: Schedule 40 complying with ASTM D1784 and ASTM D1785, and US Product Service PS 21-70 as having same outside diameter dimension as cast-iron pipe.
      c. Temperature Rating: Rated for temperature to 140 degrees F.
      d. Color: White.
   3. Fittings: Type, grade, schedule, and color of fitting shall match the associated pipe.
      a. Solvent Weld: Comply with ASTM D2466.
      b. Socket Type: Comply with ASTM D2467
      b. Flanged: Provide flanged fittings with Teflon gaskets.
   4. Joints:

a. Solvent Weld: Use primer and solvent cement recommended by PVC pipe manufacturer for the application. Primer shall be in accordance with ASTM F656, and solvent cement shall be in accordance with ASTM D2564.
b. Flanged: Provide with backup flange minimum 1/8-inch thick. Backup flanges and connecting bolts shall be Type 304 stainless steel.

2.3 FLEXIBLE TUBING

A. Flexible Tubing: Unless otherwise shown or indicated, flexible tubing shall be as follows:
1. Manufacturers: Provide products of one of the following:
a. Parker.
b. Or equal.
2. Material: Unless otherwise shown or indicated, PVC tubing shall be:
a. Instrument and laboratory grade.
b. Color: Clear.
c. Temperature Rating: -40 degrees to 150 degrees F.
d. Pressure Rating: 75 psi.
3. Fittings: Fitting shall be barbed or as recommended by tubing manufacturer.

2.4 IDENTIFICATION

A. Pipe material identification requirements are in Section 40 05 05, Exposed Piping Installation.

2.5 SOURCE QUALITY CONTROL

A. Shop Tests:
1. Pipe manufacturer shall maintain continuous quality control program.
2. Where applicable and when requested by ENGINEER, submit results of source quality control tests specified in reference standards.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect pipe materials for defects in material and workmanship. Verify compatibility of pipe and fittings.

3.2 INSTALLATION

A. For exposed piping installation, refer to Section 40 05 05, Exposed Piping Installation.

+ + END OF SECTION + +

SECTION 40 05 53

PROCESS VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install process valves, four-inch diameter and larger, and appurtenances, complete and operational.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before process valves Work.

C. Related Sections:
   1. Section 05 05 33, Anchor Systems.
   2. Section 09 91 00, Painting.
   3. Section 40 05 05, Exposed Piping Installation.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American Bearing Manufacturers Association (ABMA).
   2. ANSI B16.1, Cast-Iron Pipe Flanges and Flanged Fittings.
   3. ANSI B16.34, Valves-Flanged, Threaded and Welding end. (ASME B16.34).
   4. API STD 594, Check Valves, Flanged Lug, Wafer and Butt-Welding.
   5. API STD 598, Valve Inspection and Testing.
   6. ASTM A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
   7. ASTM A276, Specification for Stainless Steel Bars and Shapes.
   8. ASTM A536, Specification for Ductile Iron Castings.
   9. AWWA C500, Metal-Seated Gate Valves for Water Supply Service.
   10. AWWA C501, Cast-Iron Sluice Gates.
   11. AWWA C508, Swing-Check Valves for Waterworks Service, 2-inch through 24-inch NPS.
   12. NEMA MG 1, Motors and Generators.

1.3 QUALITY ASSURANCE

A. Manufacturer’s Qualifications:

1. Manufacturer shall have minimum of five years of experience producing substantially similar materials and equipment to that required and be able to provide evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain each type of equipment and appurtenances included in this Section, regardless of the component manufacturer, from a single manufacturer of the type of process valve. For each type of valve, do not furnish valves of more than one manufacturer.
   2. Supplier of each type of equipment specified shall review and approve or prepare all Shop Drawings and other submittals for all components associated with the type of process valve Supplier is furnishing.
   3. Components shall be suitable for use in the specified service conditions. Components shall be integrated into the overall assembly by the process valve manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Installation drawings showing orientation of valve in both plan and elevation view. Drawings shall clearly identify valve and its appurtenances, including controls, actuators, valve stems, and other components. Show dimensions of valves and appurtenances in relation to piping and structural and architectural components, where applicable.
      b. Calculations for sizing of operating mechanism with extension stems.
      c. Calculations for sizing of gear actuators.
   2. Product Data:
      a. Product data sheets.
      b. Complete catalog information, including dimensions, weight, specifications, and identification of materials of construction of all parts.
      c. Corrosion resistance information to confirm suitability of valve materials for the application. Furnish information on chemical resistance of elastomers from elastomer manufacturer.
      d. Cv values and hydraulic headloss curves.
   3. Testing Plans:
      a. Submit plan for shop testing of each valve for which shop testing is specified, including testing plan's and test facility's limitations proposed.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Certificates of compliance with referenced standards, where applicable, including those of AWWA, NSF, and others required by ENGINEER.

b. AIS Compliance Certificates, where applicable.

2. Manufacturer Instructions:
   a. Submit manufacturer's instructions for handling, storing, and installing valves and appurtenances. Provide templates and setting drawings for valves and appurtenances that require anchor bolts or similar anchorages.
4. Source Quality Control Submittals:
   a. Submit copies of shop test results and inspection data, certified by manufacturer.
5. Field Quality Control Submittals:
   a. Submit results of field tests required.
6. Supplier's Reports:
   a. When requested by ENGINEER, submit written report of results of each visit to Site by Supplier's serviceman, including purpose and time of visit, tasks performed and results obtained.
7. Qualifications Statements:
   a. When requested by ENGINEER, submit manufacturer's qualifications demonstrating compliance with the Specifications, including list of existing installations with contact names and telephone number(s) for each.

C. Closeout Submittals: Submit the following:
   1. Operations and Maintenance Data:
      a. Furnish operation and maintenance manuals in accordance with Section 01 78 23, Operations and Maintenance Data.
      b. Furnish in operations and maintenance manuals complete nameplate data for each valve and electric actuator.

D. Maintenance Material Submittals: Submit the following:
   1. Spare Parts, Extra Stock Materials, and Tools:
      a. Spare Parts and Extra Stock Materials: Furnish as specified for each valve type.
      b. Tools: Furnish two sets of special tools (excluding metric tools, if applicable) for each size and type of valve furnished.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Deliver materials and equipment to Site to ensure uninterrupted progress of the Work. Deliver anchorage products that are to be embedded in concrete in ample time to prevent delaying the Work.
   2. Inspect boxes, crates, and packages upon delivery to Site and notify ENGINEER in writing of loss or damage to materials and equipment. Promptly remedy loss and damage to new condition in accordance with manufacturer's instructions.
   3. Conform to Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
   1. Keep products off ground using pallets, platforms, or other supports. Store equipment in covered storage and prevent condensation and damage by extreme temperatures. Store in accordance with manufacturer's recommendations. Protect steel, packaged materials, and electronics from corrosion and deterioration.
   2. Conform to Section 01 66 00, Product Storage and Handling Requirements.

PART 2 - PRODUCTS

2.1 GENERAL

A. Valves, General:
   1. Provide each valve with manufacturer’s name and rated pressure cast in raised letters on valve body.
   2. Provide valves with brass or Type 316 stainless steel nameplate attached with Type 316 stainless steel screws. Nameplates shall have engraved letters displaying the following minimum information:
      a. Valve size.
      b. Pressure and temperature ratings.
      c. Application (other than water and wastewater).
      d. Date of manufacture.
      e. Manufacturer’s name.
   3. Provide valves to turn clockwise to close, unless otherwise specified.
   4. Provide valves with permanent markings for direction to open.
   5. Manually operated valves, with or without extension stems, shall require not more than 40-pound pull on manual operator to open or close valve against specified criteria. Gear actuator and valve components shall be able to withstand minimum pull of 200 pounds on manual operator and input torque of 300-foot pounds to actuator nut. Manual operators include handwheel, chainwheel, crank, lever, and T-handle wrench.

B. Valve Materials:
   1. Valve materials shall be suitable for the associated valve’s service or application, as shown.
   2. Protect wetted parts from galvanic corrosion caused by contact of different metals.
   3. Wetted components and wetted surfaces of valves used with potable water or water that will be treated to become potable shall conform to ANSI/NSF 61.
   4. Clean and descale fabricated stainless steel items in accordance with ASTM A380 and the following:
      a. Passivate all stainless steel welded fabricated items after manufacture by immersing in pickling solution of six percent nitric acid and three percent hydrofluoric acid. Temperature and detention time shall be sufficient for removing oxidation and ferrous contamination without

etching surface. Perform complete neutralizing operation by immersing in trisodium phosphate rinse followed by clean water wash.

b. Scrub welds with same pickling solution or pickling paste and clean with stainless steel wire brushes or by grinding with non-metallic abrasive tools to remove weld discoloration, and then neutralize and wash clean.

C. Valve Joints:
1. Exposed Valves: Unless otherwise specified, provide with flanged ends conforming to ANSI B16.1. Pressure class of flanges shall be equal to or greater than specified pressure rating of the associated valve.
2. Buried Valves: Unless otherwise specified, provide with mechanical or push-on joints, restrained or unrestrained, as required by piping with which valve is installed.
3. For stainless steel bolting, except where nitrided nuts are required, use graphite-free anti-seize compound to prevent galling. Strength of joint shall not be affected by using anti-seize compound.

2.2 RESILIENT-SEATED GATE VALVES

A. Manufacturers: Provide products of one of the following:
1. M&H Valve Company
2. Kennedy Valve.
3. Or equal.

B. General:
1. Provide valves conforming to AWWA C515 and as specified in this Section.
2. Sizes: Four-inch through 12-inch diameter.
3. Type:
a. Provide non-rising stem (NRS) valves for buried service.
b. For interior and exposed service, provide outside screw and yoke (OS&Y) rising-stem valves, unless otherwise specified.
c. Provide position indicators for NRS valves used in exposed service.
4. Minimum Rated Working Pressure:
a. Valves 12-inch Diameter and Smaller: 200 psig.
5. Maximum Fluid Temperature: 150 degrees F.
6. Provide valves with fully encapsulated resilient wedges, unless otherwise specified.

C. Materials of Construction: Shall conform to AWWA C515 and shall be as follows:
1. Valve Body, Bonnet, and Stuffing Box: Ductile-iron.
2. Wedge: Cast-iron, symmetrically, fully, and permanently encapsulated with molded rubber having minimum 1/8-inch thickness in accordance with ASTM 429.
3. Stem: Stainless steel or cast copper alloy.
4. Rubber Items: Buna-N or other synthetic rubber suitable for the application.

5. Internal and external bolting and other hardware including pins, set screws, plug, studs, bolts, nuts, and washers shall be Type 316 stainless steel.

D. Interior Coating:
   1. Valves shall be coated inside. Steel, cast-iron and ductile iron surfaces, except machined surfaces, shall be epoxy coated in accordance with AWWA C550.

E. Testing:
   1. Test valves in valve manufacturer's shop in accordance with AWWA C515.

F. Gear Actuators for Manually-operated Valves:
   1. Provide valves with gear actuators conforming to AWWA C500.
   2. Size gear actuators for the following maximum differential pressures:
      a. Valve Size and Location: As shown on the Contract Drawings.

2.3 SWING CHECK VALVES

A. Manufacturers: Provide products of one of the following:
   1. APCO Willamette Valve & Primer Corp.
   2. Crispin Valve
   3. G.A. Industries.

B. General:
   1. Provide valves conforming to AWWA C508 and as specified herein.
   2. Sizes: Four-inch through 24-inch diameter.
   3. Type: Resilient-seated.
   4. Rated Working Pressure:
      a. Smaller than 12-inch Diameter: 175 psig.
   5. Provide valves suitable for horizontal or vertical mounting.
   6. Check valves shall have clear waterway with full-open area equal to nominal pipe size.
   7. Provide check valves with outside adjustable weight and lever.
   8. Provide valves larger than six-inch diameter with adjustable air cushion chambers.
   9. Valve seats shall be mechanically attached and shall be field replaceable.
   10. Provide valves with double-pole, double-throw NEMA 1, 4, and 13 limit switch to indicate valve closed position.

C. Materials of Construction: All materials of construction shall conform to AWWA C508 and shall be as follows:
   1. Body, Disc, Cover and Gland: Cast-iron or ductile iron.
   2. Disc Arm: Ductile iron.
   3. Hinge Shaft: Type 316 stainless steel.
   4. Hinge Shaft Bushings: Bronze, or Type 316 stainless steel for sewage service.
   5. Shaft End Plate: Type 316 stainless steel.

6. Body Seat: Type 316 stainless steel.
7. Follower Ring for Rubber Seat on Disc: Type 316 stainless steel.
8. Disc Center Pin Assembly: Type 316 stainless steel.
9. Air Cushion Chamber:
    a. Chamber and Plunger: Bronze.
    b. Linkages and Pins: Type 316 stainless steel.
    c. Air Check Valve and Tubing: Brass or stainless steel.
10. Rubber Items:
    a. Applications Up to 180-degree F Fluid Temperature: Buna-N or other synthetic rubber suitable for the application.
    b. Applications 180-degrees F and Greater Fluid Temperature: Viton, or other synthetic rubber suitable for the application.
11. Internal and external bolting and other hardware; including pins, set screws, studs, bolts, nuts, and washers shall be Type 316 stainless steel.
12. Gland Packing: Graphite and Kevlar.

D. Interior Coating:
1. Valves shall be coated inside. Steel, cast-iron and ductile iron surfaces, except machined surfaces, shall be epoxy coated in accordance with AWWA C550.

E. Testing:
1. Test each valve in manufacturer's shop in accordance with AWWA C508.
2. Allowable Leakage at Rated Pressures: Zero.

2.4 AIR RELEASE VALVES

A. Manufacturers: Provide products of one of the following:
1. APCO Willamette Valve & Primer Corp.
2. Or approved equal

2.5 APPURTENANCES FOR EXPOSED METALLIC VALVES

A. General:
1. For valves located less than five feet above operating floor, provide levers on four-inch diameter quarter-turn valves, and provide handwheels on all other valves, unless otherwise shown or specified.
2. For valves located five feet or more above operating floor, provide chain operators.
3. Where indicated, provide extension stems and floorstands.

B. Handwheels:
1. Conform to applicable AWWA standards.
2. Material of Construction: Ductile iron, or cast aluminum.
3. Arrow indicating direction of opening and word "OPEN" shall be cast on trim of handwheel.
4. Maximum Handwheel Diameter: 2.5 feet.

C. Chain Operators:
   1. Chains shall extend to three feet above operating floor.
   2. Provide 1/2-inch stainless steel hook bolt to keep chain out of walking area.
   3. Materials of Construction:
      a. Chain: Type 316L stainless steel or galvanized steel.
      b. Chainwheel: Recessed groove type made out of Type 316 stainless steel or galvanized steel.
      c. Guards and Guides: Type 316L stainless steel or galvanized steel.
   4. Chain Construction:
      a. Chain shall be of welded link type with smooth finish. Chain that is crimped or has links with exposed ends is unacceptable.
   5. Provide geared operators where required to position chainwheels in vertical position.

D. Crank Operator:
   1. Crank operator shall be removable and fitted with rotating handle.
   2. Maximum Radius of Crank: 15 inches.
   3. Materials:
      a. Crank: Cast-iron or ductile iron.
      b. Handle: Type 304 stainless steel.
      c. Hardware: Type 304 stainless steel.

E. Extension Stems and Floor Stands for Gate Valves:
   1. Conform to the applicable requirements of AWWA C501 for sizing of complete lifting mechanism.
   2. Bench and Pedestal Floor Stands:
      a. For valves requiring extension stems, provide bench or pedestal floor stands with handwheel or crank as indicated. Provide provisions for using portable electric actuator for opening and closing of valves.
      b. Type: Heavy-duty with tapered roller bearings enclosed in a weatherproof housing, provided with positive mechanical seals around lift nut and pinion shaft to prevent loss of lubrication and to prevent moisture from entering housing. Provide lubrication fitting for grease. For valves conveying water that is potable or that will be treated to become potable, grease shall be food-grade and ANSI/NSF 61-listed. Base shall be machined.
      c. Materials of Construction:
         1) Housing: Cast-iron, ASTM A126, Class B.
         2) Lift Nut: Cast bronze, ASTM B98/B98M.
         3) Grease Fitting: Stainless steel.
         4) Bolting: Type 316 stainless steel.
   3. Wall brackets for floor stands shall be Type 316L stainless steel construction.
   4. Extension Stems:
      a. Materials of Stems and Stem Couplings: Type 316 stainless steel.
      b. Maximum Slenderness Ratio (L/R): 100.
      c. Minimum Diameter: 1.5-inch.
      d. Threads: Acme.

e. Provide stem couplings where stems are furnished in more than one piece. Couplings shall be threaded and keyed or threaded and bolted and shall be of greater strength than the stem.
f. Weld to bottom of extension stem a Type 316 stainless steel cap suitable for square end of valve stem.

5. Bottom Couplings: Ductile iron with Type 316 stainless steel pin and set screw.
6. Stem Guides:
   a. Material: Type 316 cast stainless steel with bronze bushing for stem. For submerged service, Type 316 cast stainless steel with stainless steel bushing for stem.
   b. Maximum Stem Length Between Guides: Seven feet.
   c. Stem guides shall be adjustable in two directions.
7. Furnish stem cover of clear butyrate plastic or Grade 153 Lexan with cast adapter for mounting cover to bench and floor stands. Provide stem cover with gasketing and breathers to eliminate water intrusion into operator and condensation within cover. Provide stem cover with mylar tape with legible markings showing valve position at one-inch intervals and open and close limits of valve.

F. Floor Boxes: Provide cast-iron floor boxes for valves that are to be operated from floor above valve. Boxes shall be equal in depth to floor slab. Boxes shall have cast-iron covers and be fitted with bronze bushing.

2.6 ANCHORAGES AND MOUNTING HARDWARE

A. General:
1. Comply with Section 05 05 33, Anchor Systems, except as modified in this Section.
2. Obtain bolts, nuts, and washers for connection of valve and appurtenances to concrete structure or other structural members from valve Supplier.
3. Bolts, nuts, and washers shall be of ample size and strength for purpose intended. Anchorages in concrete shall be at least 5/8-inch diameter.
4. Provide stem guide anchorages of required strength to prevent twisting and sagging of guides under load.
5. Materials: Provide bolts and washers of Type 316 stainless steel and nitrided nuts. Bolts shall have rolled threads. Bolts and nuts shall be electropolished to remove burrs.

2.7 TOOLS, LUBRICANTS, AND SPARE PARTS

A. Lubricants: For valves, actuators, and appurtenances requiring lubricants, provide suitable lubricants for initial operation and for first year of use following Substantial Completion. Lubricants for equipment associated with conveying potable water or water that will be treated to become potable shall be food-grade and ANSI/NSF 61-listed.

B. Tools, spare parts, and maintenance materials shall conform with Section 01 78 43, Spare Parts and Extra Materials.

2.8 PAINTING OF EXPOSED VALVES, HYDRANTS, AND APPURTENANCES

A. Exterior steel, cast-iron, and ductile iron surfaces, except machined surfaces of exposed valves and appurtenances, shall be finish painted in manufacturer's shop. Surface preparation, priming, finish painting, and field touch-up painting shall conform to Section 09 91 00, Painting.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials and equipment are to be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
   1. Install valves and appurtenances in accordance with:
      a. Supplier's instructions and the Contract Documents.
      b. Requirements of applicable AWWA standards.
      c. Applicable requirements of Section 33 05 05, Buried Piping Installation, and Section 40 05 05, Exposed Piping Installation.
   2. Install valves plumb and level. Install all valves to be free from distortion and strain caused by misaligned piping, equipment, and other causes.
   3. Position swing check valves and butterfly valves so that, when valve is fully open, valve disc does not conflict with piping system elements upstream and downstream of valve.

B. Exposed Valves:
   1. Provide supports for large or heavy valves and appurtenances as shown or required to prevent strain on adjoining piping.
   2. Operators:
      a. Install valves so that operating handwheels or levers can be conveniently turned from operating floor without interfering with access to other valves, piping, structure, and equipment, and as approved by ENGINEER.
      b. Avoid placing operators at angles to floors or walls.
      c. Orient chain operators out of way of walking areas.
      d. Install valves so that indicator arrows are visible from floor level.
      e. For motor-operated valves located lower than five feet above operating floor, orient motor actuator to allow convenient access to pushbuttons and handwheel.

3. Floor Stands and Stems:
    a. Install floor stands as shown and as recommended by manufacturer.
    b. Provide lateral restraints for extension bonnets and extension stems as shown and as recommended by manufacturer.
    c. Provide sleeves where operating stems pass through floor. Extend sleeves two inches above floor.

3.3 FIELD QUALITY CONTROL

A. Field Tests:
1. Adjust all parts and components as required to provide correct operation of valves.
2. Conduct functional field test on each valve in presence of ENGINEER to demonstrate that each valve operates correctly.
3. Verify satisfactory operation and controls of motor operated valves.
4. Demonstrate satisfactory opening and closing of valves at specified criteria requiring not more than 40 pounds effort on manual actuators.
5. Test ten percent of valves of each type by applying 200 pounds effort on manual operators. There shall be no damage to gear actuator or valve.

B. Supplier's Services:
1. Provide services of qualified factory-trained service technicians to check and approve installation of the following types of valves:
    a. Gate valves.
    b. Check valves.
2. Manufacturer's representative shall make a minimum of 1 visits, with a minimum of 8 hours onsite for each visit. First visit shall be for unloading supervision (if specified) and instruction of CONTRACTOR in installing equipment; second visit shall be for assistance in installing equipment; third visit shall be for checking completed installation and start-up of system; fourth visit shall be to instruct operations and maintenance personnel. Representative shall revisit the Site as often as necessary until installation is acceptable.
4. Training: Furnish services of Supplier's qualified factory trained specialists to instruct OWNER's operations and maintenance personnel in recommended operation and maintenance of equipment. Training requirements, duration of instruction and qualifications shall be in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.
5. All costs, including expenses for travel, lodging, meals and incidentals, and cost of travel time, for visits to the Site shall be included in the Contract Price.

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SECTION 40 05 85.33

PIPING SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install piping specialties specified herein, and appurtenances, complete and operational.
   2. Section includes:
      a. Tapping sleeves.
      b. Line stops.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before process valves Work.

C. Related Sections:
   1. Section 05 05 33, Anchor Systems.
   2. Section 09 91 00, Painting.
   3. Section 40 05 05, Exposed Piping Installation.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. AWWA C110, Ductile Iron Pipe and Gray Iron Fittings.
   2. AWWA C151, Ductile Iron Pipe, Centrifugally Cast.
   3. ASTM A148, Standard Specification for Steel Castings, High-Strength, for Structural Purposes.
   4. ASTM A536, Standard Specification for Ductile Iron Castings.

1.3 QUALITY ASSURANCE

A. Manufacturer’s Qualifications:
   1. Manufacturer shall have minimum of five years of experience producing substantially similar materials and equipment to that required and be able to provide evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain each type of equipment and appurtenances included in this Section, regardless of the component manufacturer, from a single manufacturer of

the type of process valve. For each type of valve, do not furnish valves of more than one manufacturer.

2. Supplier of each type of equipment specified shall review and approve or prepare all Shop Drawings and other submittals for all components associated with the type of process valve Supplier is furnishing.
3. Components shall be suitable for use in the specified service conditions. Components shall be integrated into the overall assembly by the process valve manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Installation drawings showing orientation of valve in both plan and elevation view. Drawings shall clearly identify valve and its appurtenances, including controls, actuators, valve stems, and other components. Show dimensions of valves and appurtenances in relation to piping and structural and architectural components, where applicable.
   2. Product Data:
      a. Product data sheets.
      b. Complete catalog information, including dimensions, weight, specifications, and identification of materials of construction of all parts.
   3. Testing Plans:
      a. Submit plan for shop testing of each valve for which shop testing is specified, including testing plan's and test facility's limitations proposed.

B. Informational Submittals: Submit the following:
   1. Certificates:
      a. Certificates of compliance with referenced standards, where applicable, including those of AWWA, and others required by ENGINEER.
   2. Manufacturer Instructions:
      a. Submit manufacturer's instructions for handling, storing, and installing valves and appurtenances. Provide templates and setting drawings for valves and appurtenances that require anchor bolts or similar anchorages.
   3. Plans:
      a. Tapping Plan – Including sequence and schedule of tapping operation, means and methods, necessary coordination elements, and other elements for safe and complete installation.
      b. Line Stop Plan – Including sequence and schedule of line stop operation, means and methods, necessary coordination elements, and other elements for safe and complete installation.
   4. Supplier's Reports:

a. When requested by ENGINEER, submit written report of results of each visit to Site by Supplier's serviceman, including purpose and time of visit, tasks performed and results obtained.

5. Qualifications Statements:
   a. When requested by ENGINEER, submit manufacturer's qualifications demonstrating compliance with the Specifications, including list of existing installations with contact names and telephone number(s) for each.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Deliver materials and equipment to Site to ensure uninterrupted progress of the Work. Deliver anchorage products that are to be embedded in concrete in ample time to prevent delaying the Work.
   2. Inspect boxes, crates, and packages upon delivery to Site and notify ENGINEER in writing of loss or damage to materials and equipment. Promptly remedy loss and damage to new condition in accordance with manufacturer's instructions.
   3. Conform to Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
   1. Keep products off ground using pallets, platforms, or other supports. Store equipment in covered storage and prevent condensation and damage by extreme temperatures. Store in accordance with manufacturer's recommendations. Protect steel, packaged materials, and electronics from corrosion and deterioration.
   2. Conform to Section 01 66 00, Product Storage and Handling Requirements.

PART 2 - PRODUCTS

2.1 TAPPING SLEEVES

A. Manufacturers: Provide products of one of the following:
   1. BTR, Inc./Smith-Blair, Inc., Style 622.
   2. Romac Industries, Inc., Style FTS 420.
   3. Or equal.

B. General:
   1. Sizes: As required.
   2. Minimum rated working pressure: 250 psi.

C. Materials of Construction:
   1. Body: ASTM A240 Type 304 stainless steel.
   2. Flange: Type 304 stainless steel with ANSI bolt circles.
   3. Sidebars: ASTM A240 Type 304 stainless steel, heavy gauge.
   4. Nuts and bolts: Type 304 stainless steel.

5. Test plug: Type 304 stainless steel.
6. Gaskets: Rubber.

2.2 LINE STOPS

A. Manufacturers: Provide products of one of the following:
   1. Hydra-Stop.
   2. Or equal.

B. General:
   1. Sizes: As required.
   2. Minimum rated working pressure: 250 psi.

C. Materials of Construction:
   1. Tapping Sleeves: As Specified in Article 2.1.
   2. Flange: Type 304 stainless steel.
   4. Completion plug: Reinforced composite polymer.
   5. Blind Flange: Type 304 stainless steel.
   6. Bolts and Nuts: Type 304 stainless steel.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which materials and equipment are to be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
   1. Install specialties and appurtenances in accordance with:
      a. Supplier's instructions and the Contract Documents.
      b. Requirements of applicable AWWA standards.
      c. Applicable requirements of Section 33 05 05, Buried Piping Installation, and Section 40 05 05, Exposed Piping Installation.

3.3 FIELD QUALITY CONTROL

A. Field Tests:
   1. Adjust all parts and components as required to provide correct operation of valves.
   2. Conduct functional field test on each valve in presence of ENGINEER to demonstrate that each valve operates correctly.

B. Supplier's Services:

1. Provide services of qualified factory-trained service technicians to check and approve installation.
2. Manufacturer's representative shall make a minimum of 1 visits, with a minimum of 8 hours onsite for each visit. First visit shall be for unloading supervision (if specified) and instruction of CONTRACTOR in installing equipment; second visit shall be for assistance in installing equipment; third visit shall be for checking completed installation and start-up of system; fourth visit shall be to instruct operations and maintenance personnel. Representative shall revisit the Site as often as necessary until installation is acceptable.
3. All costs, including expenses for travel, lodging, meals and incidentals, and cost of travel time, for visits to the Site shall be included in the Contract Price.

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SECTION 40 05 93

COMMON MOTOR REQUIREMENTS FOR PROCESS EQUIPMENT

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. Electric motors and accessories to be furnished under other equipment Sections shall comply with this Section, unless specified otherwise in the Section for the associated driven equipment.
2. Motor horsepower and voltage ratings, speed, enclosure type, and unusual service conditions (such as ambient temperatures above 40 degrees C, corrosive areas requiring severe duty motors, and variable frequency drive applications requiring inverter duty motors), and requirements for witnessing shop tests shall be as specified in the Sections for the associated driven equipment. Specific accessories and construction features may also be required by the Sections on the associated driven equipment.

1.2 REFERENCES

A. Standards referenced in this Section are:
1. ASTM A48/A48M, Specification for Gray Iron Castings.
2. ASTM B117, Practice for Operating Salt Spray (Fog) Apparatus.
3. IEEE 112, Test Procedure for Polyphase Induction Motors and Generators.
4. IEEE 522, Guide for Testing Turn-to-Turn Insulation on Form-Wound Stator Coils for Alternating Current Electric Machines.
5. IEEE 841, Petroleum and Chemical Industry - Premium-Efficiency, Severe-Duty, Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors – Up to and Including 370 KW (500 HP).
6. IEEE 1043, Recommended Practice for Voltage Endurance Testing of Form-Wound Bars and Coils.
7. NEMA MG 1, Motors and Generators. (This Section's references to NEMA MG 1 followed by a hyphen and number, such as “NEMA MG 1-20.14”, indicate the associated NEMA MG 1 paragraph reference.)
8. ANSI/NETA ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems
9. UL 674, Electric Motors and Generators, for Use in Division 1 Hazardous (Classified) Locations.
10. UL 1004, Electric Motors.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer:
    a. Manufacturer shall have not less than five years experience producing equipment substantially similar to that required and shall be able to submit documentation of at least five installations in satisfactory operation for at least five years each.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
1. Shop Drawings:
    a. Data sheets indicating nameplate data for fractional-horsepower motors.
    b. Outline drawing or data sheet indicating complete motor dimensions for motors rated greater than 1/3-hp. Several motors of the same type and rating for the same application may be covered by an appropriate single drawing or data sheet. Drawings and data sheets shall have complete identifying data including frame size, speed, horsepower ratings, and application for each particular motor.
    c. Details of motor heaters, winding thermal protection, and other accessories.
    d. Copies of motor characteristic curves and data inputs when required for programming motor protection and management relays.
2. Product Data:
    a. Submit motor test data sheets for each motor rated one horsepower or greater. Values indicated on test data sheets shall be from tests of a previously manufactured, electrically duplicate motor or calculated data. Mark each test data sheet to indicate the Project motor application location, manufacturer, type, frame size, horsepower, voltage, speed, bearing type, lubrication medium and enclosure type. Test data sheet shall also include:
        1) Winding resistances.
        2) Torques.
        3) Efficiencies.
        4) Power factors.
        5) Slip.
        6) Full load amperes.
        7) Locked rotor and no load amperes.
        8) Nameplate temperature and results of dielectric tests.
3. Testing Plans and Procedures:
    a. When witnessed source quality control testing is required in the Section for associated driven equipment, submit description of proposed shop testing methods, procedures, and testing apparatus with calibration dates, together with proposed testing schedule and proposed travel and logistical plans for testing.

B. Informational Submittals: Submit the following:
   1. Manufacturer's Instructions:
      a. Instructions and recommendations for handling, storing, protecting the motors.
      b. Installation data for motors, including setting drawings, templates, and directions and tolerances for installing anchorage devices.
   2. Source Quality Control Submittals:
      a. Written reports presenting results of required shop testing. Shop test reports shall be dated and signed by motor manufacturer.
      b. When witnessed shop tests are required, shop test results shall be signed by and shall bear the seal of registered professional engineer. Name on seal, registration or license number, and jurisdiction or registration of license shall be legible.
   3. Field Quality Control Submittals:
      a. Written reports presenting results of required field testing and inspections. Field testing reports shall be dated and signed by CONTRACTOR.
   4. Supplier Reports:
      a. Submit written report of results of each visit to Site by Supplier's service personnel, including purpose and time of visit, persons contacted, problems encountered and resolved, tasks performed, results obtained, and other pertinent information. Submit within two days of completion of visit to the Site.
   5. Qualifications Statements:
      a. Submit manufacturer's qualifications data when requested by ENGINEER.

C. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Data:
      a. Furnish operation and maintenance data for motors as part of the operations and maintenance data for the associated driven equipment.
      b. Comply with Section 01 78 23, Operations and Maintenance Data.

D. Maintenance Material Submittals: Submit the following:
   1. Spare Parts and Extra Stock Materials: For each motor size and type, furnish spare parts in accordance with motor manufacturer's recommendations, including the following for three-phase motors:
      a. One set of fans and guards for each set of three or fewer motors, for each size of totally-enclosed fan-cooled motor.
      b. One set of bearing liners, or renewable ball or roller bearings, for each set of three or fewer motors, for each type and size of motor.
      c. One set of oil rings, for each sleeve bearing motor.
      d. One set of bearing temperature detectors, for each set of three or fewer motors, of each type of motor.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
   1. Ship motors with openings sealed.

B. Storage and Protection:
   1. Protect materials and equipment from corrosion and deterioration.

PART 2 – PRODUCTS

2.1 EQUIPMENT PERFORMANCE

A. Equipment Description:
   1. Comply with motor requirements specified in the Sections for the associated driven equipment.
   2. Motors shall be suitable for continuous operation at an elevation of up to 3,300 feet above mean sea level, at ambient temperatures ranging from -25 degrees C to 40 degrees C, unless specified otherwise in the Section for the associated driven equipment.

2.2 CONSTRUCTION – GENERAL

A. Unless specified otherwise in Sections on the associated driven equipment, motors shall have the following features of construction and operation:
   1. Successfully operate under power supply variations in accordance with NEMA MG 1-14.30 and NEMA MG 1-20.14.
   2. NEMA Design B with torque and starting currents in accordance with NEMA MG 1, except in special high-torque applications, as specified in the Section for the associated driven equipment, which may require NEMA Design C.
   3. Motors shall operate within their full load rating without applying the service factor, unless specified otherwise in Section for the associated driven equipment.
   4. Speed and horsepower specified or required to properly operate the associated driven equipment and torque characteristics required by the drive load and suitable for direct coupling or V-belt drive, as specified in the Section for the associated driven equipment.
   5. Constructed for full-voltage starting.
   6. Fabricated steel or cast-iron frames with integrally cast feet or bases, cast-iron end bells, cast iron or steel conduit boxes and covers and bases with precision machined bearing fits, ASTM A48/A48M, Class 25 or better. For each TEFC motor, provide UL-approved automatic stainless steel breather drains in lowest part of front and back brackets to allow drainage of condensation.
   7. Stator core assembly shall consist of stacked lamination made from specially selected electrical sheet silicon steel.
   8. Rotor cages shall be die-cast or fabricated aluminum or fabricated copper or copper alloy. Shafts shall be carbon steel unless specified otherwise in this Section or in the Section on the associated driven equipment.

9. Rotors on frames 213T and larger shall be keyed shrunk or welded to shaft and rotating assembly, dynamically balanced to NEMA limits. Use rivets to secure balance weights, if required, to rotor resistance ring or fan blades. Machine screws and nuts are unacceptable. Coat entire rotating assembly between bearing inner caps with corrosion-resistant epoxy.
10. Bolt and cap screws shall be high-strength, SAE Grade 5 zinc-plated and chromatic steel. Screwdriver slot fasteners are unacceptable.
11. Motors shall be shop-painted at the motor fabrication facility. Finish coat shall be the same color as the associated driven equipment. Final paint finish shall be corrosive resistant and capable of passing ASTM B117 250-hour salt spray test. Motors that will be located outdoors shall have coating resistant to degradation or chalking in sunlight.

2.3 SINGLE-PHASE AC MOTORS

A. Motors shall be rated 115-, 208-Volt, 60 Hertz.

B. Bearings shall be grease-lubricated ball type with grease fittings or with lubrication for 10 years of normal operation.

C. Motors shall be totally enclosed except fractional-horsepower motors may be open type if motor is suitably protected from moisture, dripping water, and airborne particulates accumulation. Motor features shall be in accordance with the following:
   1. Open motors shall be split-phase or capacitor start in accordance with torque requirements, with service factor of not less than 1.25, 40 degrees C ambient rating, and Class B insulation.
   2. Enclosed motors shall be capacitor start, with service factor of not less than 1.15, 40 degrees C ambient rating, and Class F insulation. Motors shall be fan-cooled or non-ventilated.
   3. Severe duty type motors shall be designed to withstand chemical corrosion and equipped with cast iron end shields, neoprene gaskets, stainless steel shaft, heavy pressed steel fan cover and provision for threaded conduit connection.
   4. Provide direct drive fan motors with conduit fittings and leads to allow external connection.
   5. Explosion-proof motors shall comply with UL 674.

2.4 THREE-PHASE AC MOTORS

A. General: Unless specified otherwise in the Sections for the associated driven equipment, provide three-phase motors with the following features:
   1. Premium, energy-efficient construction complying with NEMA MG 1.
   2. Motor efficiency determined in accordance with NEMA MG 1-12.58.
   3. Minimum and nominal full-load efficiencies not less than those listed in: NEMA MG 1 Table 12-12 for motors rated 600 volts and smaller, and NEMA MG 1 Table 12-13 for motors rated larger than 600 volts and equal to or less than 5,000 volts.

4. Motors shall be constructed for operation on three-phase, 60 Hertz, alternating current system. Motor voltage and variable frequency operation, where required, shall be as specified in the Sections for the associated driven equipment. Voltage ratings shall be 200 volts for operation on 208-volt systems\.
5. Unless otherwise required by the load, motors shall be NEMA Design B, normal starting torque. Locked rotor KVA/HP shall not exceed NEMA Code Letter G for motors 20 hp and larger.
6. Motor frame shall be a rigid structure, constructed to maintain the lamination in correct alignment, and shall not depend on lamination or bolts for rigidity.
7. Severe-duty totally-enclosed motors shall comply with IEEE 841.

B. Bearings:
1. Provide horizontal motors with rolling element (anti-friction) or sliding element (sleeve) type bearings. Use anti-friction type bearings for NEMA frame motors. Use sleeve type bearings when specified in the Section for the associated driven equipment.
2. Insulate the bearings for motors larger than 200 hp and for inverter-duty motors 100 hp and larger, to prevent shaft currents and related bearing damage.
3. Bearings for open drip-proof, TEFC, and explosion-proof motors shall be grease lubricated, ball type, unless specified otherwise in the Section for the associated driven equipment. Bearings shall have inlet fittings and outlet plugs. Protect bearings and grease reservoirs from entry of contaminants. Provide suitable fittings to allow convenient positive purging of old grease during re-greasing.
4. For horizontal motors with ratings up to and including 500 hp, or for motors with speeds up to and including 3600 rpm, and where both conditions apply, anti-friction bearings furnished shall have a minimum L-10 bearing life of 100,000 hours, as defined by the ABMA, for direct-connected motors, and L-10 bearing life of 50,000 hours for belted motors.
5. Sleeve bearings shall be ring-oiled with adequate, integral self-cooled oil reservoir. Bearing sleeves shall be lined with high tin content babbitt to minimize oil contamination. Close running shaft seals shall prevent oil leakage as well as prevent entrance of foreign material such as water and dirt into the bearing area. Provide oil level sight gauges with permanently-marked easily-discernible oil level. Provide inspection openings to observe the oil rings.
6. When specified in Section for the associated driven equipment or required by motor speed and bearing size, provision shall be made for forced lubrication. Provide oil rings and an adequate oil reservoir in bearing housings to allow orderly shutdown of motor in the event of failure of forced feed lubrication system.
7. Provide vertical motors with thrust bearings adequate for all thrusts to which motor can be subjected. Rated minimum L-10 life of the thrust bearings shall be at least 15,000 hours when operated at rated speed and full load thrust. Manufacturers of the associated driven equipment shall furnish motor manufacturer with speed and thrust conditions required by the associated driven equipment.

C. Insulation:
   1. Insulation systems shall be rated Class F, with a service factor of 1.15 times motor's nameplate horsepower rating when operated on a sine wave power supply, and a service factor of 1.00 on an adjustable frequency power supply. Temperature rise shall be limited to Class B insulation system when motor is operated continuously at rated horsepower with ambient temperature not exceeding 40 degrees C, unless specified otherwise in the Section for the associated driven equipment.
   2. Windings shall be epoxy-coated. Treat windings with insulating compound suitable for protecting against moisture, salt air, and slightly acidic and alkaline conditions. Insulation system for enclosed motors shall be upgraded to increase moisture resistance.
   3. Motors for outdoor service and all motors larger than 200 hp shall have vacuum/pressure-impregnated epoxy insulation (VPI) for moisture resistance. Motors shall be preheated before VPI and baked in temperature-controlled oven.
   4. Stator windings and end turn connections shall be fully brazed to withstand full voltage starting, regardless of the starting method indicated in the Section for the associated driven equipment. Bracing system shall essentially eliminate coil vibration under the high-current conditions of starting as well as during normal operation. When a tied system is used, system shall be such that no tie depends on the integrity of another tie within the system.

D. Enclosures:
   1. Motor enclosure type shall be as specified in the Section for the associated driven equipment. Enclosure types shall comply with the following:
      a. Open Drip Proof: Motors shall have a steel or cast-iron frame, cast-iron end brackets, and steel conduit box. Provide vertical motors of the open type with drip hoods. When the drip hood is too heavy to be easily removed, provide access for testing. Provide stainless steel corrosion-resistant screens over air openings in accordance with NEMA requirements for guarded machines.
      b. Weather Protected Type I and Type II: Weather-protected motor shall be an open drip proof guarded machine with ventilating passages constructed to minimize entrance of rain, snow, and airborne particles to motor's electric parts complying with NEMA MG 1-1.25.8
      c. Totally enclosed fan cooled and non-ventilated motors shall have cast-iron frame, cast-iron end brackets, and cast-iron conduit box. Provide drain holes on each end of motor.
      d. Explosion-proof motors shall comply with NEMA MG 1-1.26.10 and UL 674.
   2. Motor conduit box shall be split from top to bottom, shall be capable of being rotated to four positions 90 degrees apart, and shall comply with the following:
      a. Box shall be gasketed with rubber-like gaskets between frame and conduit box and between conduit box and conduit box cover.
      b. Provide box or opening in motor housing with conduit hub type fitting to

allow threaded conduit connections.

c. Box sizes shall be in accordance with code requirements and shall accommodate medium-voltage terminations or stress cones, when required.

d. Protective and auxiliary devices shall terminate in auxiliary conduit boxes.

e. Terminal leads shall be flexible and of sufficient length to extend for distance of not less than ten inches beyond face of terminal box. Terminal leads shall be fitted with solderless lugs suitable for attachment to lugs installed on external wiring. Leads shall be sealed with non-wicking, non-hygroscopic insulating material, or insulating "wrap-cap" as manufactured by Ideal Industries, or equal.

f. Provisions for terminal box size, length of leads, size of conduit openings, and type of terminal lugs shall be complied with irrespective of other standards or practice.

g. Provide motor frame grounding stud inside conduit box. Stud shall include a drilled and tapped hole.

E. Vertical Motors:

1. Vertical motors shall have Type P base specifically constructed for vertical installation. Universal position motors are unacceptable.
2. Vertical motors shall have solid shafts, unless otherwise specified in Section for the associated driven equipment.

F. Lifting Eyes: Motors weighing more than 50 pounds shall include at least one lifting eye or lifting lug. Construct motor and lifting eyes or lifting lugs to bear motor's full weight.

2.5 ACCESSORIES

A. General:

1. Provide motor accessories in accordance with this Section unless specified otherwise in the Section for the associated driven equipment.
2. Provide space heaters in motors five horsepower and larger installed outdoors, and in enclosed motors five horsepower and larger installed indoors in unheated spaces.
3. Provide thermostat type winding thermal protection for motors in accordance with the following:
   a. Constant speed motors when specified in Section for the associated driven equipment.

B. Space Heaters:

1. Space heaters for condensation prevention shall operate at 120 volts and shall be sized to provide approximately 10 degrees C temperature rise above ambient.
2. Heaters shall be low-density type for low surface temperature and long life.

C. Winding Thermal Protection:
   1. Thermostats shall be bi-metal disk or rod type embedded in the stator windings. Thermostat contacts shall be normally-closed, automatic-reset type, rated 120 vac, five amps minimum, opening on excessive temperature. Provide three thermostats, one in each phase, wired to motor junction box.
   2. Thermistors embedded in each stator phase winding shall be in direct contact with the winding conductors. Each thermistor circuit shall be factory-wired to 120-volt solid-state control module mounted at the motor in box rated NEMA 4X. Control module contacts shall be automatic-reset type, rated 120 vac, five amps minimum, opening on excessive temperature. Provide normally-closed isolated contact for motor shutdown.
   3. Resistance temperature detectors (RTD) shall be 100-ohm platinum three-lead type with calibrated resistance-temperature characteristics. Position detectors, two per phase for non-explosion proof motors and one per phase for explosion proof motors, to detect highest winding temperature and located between coil sides in stator slots. Detector leads shall be wired to a separate terminal box.

D. Bearing Temperature Protection: When specified in Section for the associated driven equipment, provide motor bearing temperature detectors, RTD type similar to the winding detectors specified in this Article, on each bearing for horizontal motors and on the thrust bearing for vertical motors.

E. Vibration Protection: When specified in Section for associated driven equipment, provide accommodations for mounting sensors for monitoring bearing or casing vibration.

F. Single-Phase Motors: Single-phase motors requiring auxiliary starting resistors, capacitors or reactors and switching devices shall be provided as combination units with such auxiliaries either incorporated within motor housings or housed in suitable enclosures mounted on motor frames. Each combination unit shall be mounted on a single base and be provided with a single conduit box.

2.6 IDENTIFICATION

A. Nameplates:
   1. Nameplates shall be Type 316 stainless steel with embossed or pre-printed lettering and fastened to the motor frame with Type 316 stainless steel pins.
   2. Nameplates shall have stamped on them the motor manufacturer's name, voltage, number of Hertz and phases, horsepower rating, amperes and temperature rise at rated load, full load speed, locked rotor amperes or code letter, service factor, NEMA nominal efficiency, model number, insulation class, bearing number, serial number and maintenance manual number.
   3. Name plates for explosion proof motors shall indicate the Division, Class and Group of the hazardous location in which the motor is intended for use.
   4. Dual-voltage motor nameplates shall include connection diagrams.
   5. Nameplate markings shall be in accordance with NEMA MG 1-10.

2.7 SOURCE QUALITY CONTROL

A. Shop Tests:
   1. Perform shop testing on the motors at the manufacturer's facility. Shop test shall be in accordance with NEMA MG 1, UL 674, and UL 1004 and shall demonstrate that the motors tested comply with the Contract Documents.
   2. Submit shop test reports identifying tests performed and results obtained.
   3. Motors shall be given Routine Test in accordance with NEMA MG 1-12.55 and IEEE 112. Test shall include the following:
      a. Measurement of winding resistance.
      b. No-load readings of current and speed at normal voltage and frequency.
      c. Current input at rated frequency with rotor at standstill for squirrel-cage motors (locked rotor amperes).
      d. High-potential test.
      e. Bearing inspection.
   4. Motors with stator windings rated greater than six kV shall have the following additional tests:
      a. Voltage endurance test of the ground-wall insulation system in accordance with IEEE 1043.
      b. Partial discharge testing of the stator coils to insure proper impregnation and clearances. Acceptance criteria shall be based on manufacturer's quality assurance data base.
      c. Voltage surge test on multi-turn stator coils in accordance with IEEE 522.

B. Witnessed Shop Testing:
   1. When witnessed motor shop testing, which may also be referred to as witnessed source quality control motor testing, is specified in the Section for associated driven equipment, shop tests shall be witnessed at the motor manufacturer's testing and production facility. The number of attendees shall as indicated in the Sections for the associated driven equipment.
   2. Dates of witnessed testing shall be acceptable to OWNER and ENGINEER and shall be agreed upon in writing at least 45 days prior to the actual test. Perform all witnessed tests at motor manufacturer's facility in one day or on consecutive days to minimize the time required to witness the tests.
   3. OWNER will be responsible for cost of OWNER's and ENGINEER's time for first test on each motor, and for time to travel to and from motor manufacturer's facility once. Responsibility for cost of lodging, meals, and travel expenses shall be as indicated in the Section for the associated driven equipment.
   4. If re-testing is required, all labor and expense costs incurred by OWNER and ENGINEER will be deducted from the Contract Price via a Change Order. If tests are not performed on agreed-upon date as a result of CONTRACTOR's or motor manufacturer's action or inaction and OWNER or ENGINEER incurs lost time or expense as a result of such action or inaction, the associated costs will be deducted from the Contract Price via a Change Order.

5. Not less than the number of days prior to the scheduled witnessed motor test specified in Paragraph B.2 of this Article, submit to ENGINEER the proposed witness testing plans and procedures.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General:
   1. Install motors in accordance with the Contract Documents and manufacturer's instructions and recommendations. Obtain written interpretation from ENGINEER in the event of conflict between manufacturer's instructions and recommendations and the Contract Documents.
   2. Install in accordance with Laws and Regulations.
   3. Do not modify structures to facilitate installation of motors, unless approved in writing by ENGINEER.
   4. Carefully and properly align motors with the driven equipment.
   5. Secure motors to mounting surfaces with anchorage devices complying with manufacturer’s recommendations that are of sufficient size and quantity to secure motor to equipment.
   6. Until start-up and operation, tightly cover and protect motors from dirt, water, and chemical and mechanical damage.

3.2 FIELD QUALITY CONTROL

A. Site Tests:
   1. Inspect motors prior to supplying electricity to (energizing) equipment. Do not energize equipment without ENGINEER's permission. Inspections shall include the following:
      a. Inspect motor and equipment for physical damage.
      b. Inspect motor for proper anchorage, mounting, grounding, connection, and lubrication.
      c. Check for unusual noise and indications of overheating during initial or test operation.

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SECTION 40 60 05

INSTRUMENTATION AND CONTROL FOR PROCESS SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish, install, calibrate, test, start-up, and place in satisfactory operation a complete and operating instrumentation and control system at Weaver Street Pumping Station.
   2. CONTRACTOR shall provide the services of a single Instrumentation and Controls (I&C) Subcontractor to furnish and install all materials, equipment, labor and services, except for those services and materials specifically noted, required to achieve a fully integrated and operational instrumentation and control system at each identified pump station as specified herein.
   3. I&C Subcontractor Scope of Work includes, but is not limited to, the following:
      a. Furnish and install panels and panel mount instruments:
         1) Weaver Street Pump Station Control Panel (PS-WVR-CP).
         2) Weaver Street Pump Station Network Cabinet (PS-WVR-NC).
         3) Backup Float Control Panel.
         4) Bubbler Panel.
      b. Furnish and install programmable logic controller (PLC) and operator interface terminal (OIT) hardware and software.
      c. Provide factory acceptance testing of control panel hardware and software.
      d. Furnish and install field mounted instruments.
      e. Coordinate and install OWNER provided network hardware. Coordinate installation of internet service provider (ISP) hardware. Furnish and install all ethernet patch cords and wiring in PLC panels and network cabinets required for interfacing OWNER provided hardware and ISP hardware to provide one fully integrated system.
      f. Furnish and install uninterruptible power supply systems.
      g. Furnish and install autodialer hardware as shown and specified. Provide the services of a an authorized RACO manufacturer representative to program autodialer hardware and existing alarm server software as specified.
      h. Provide startup services and training for furnished equipment.
   4. Items specifically excluded from the I&C Subcontractor's scope of work include the following:
      a. PLC Programming, OIT graphic configuration, testing of PLC logic and OIT graphics, and startup/training activities associated with programmed portions of the PLC and OIT graphic configuration. These services will

be provided by the ENGINEER. ENGINEER will program PLC and configure OIT graphics in accordance with OWNER's approved format as detailed in OWNER's Standards Document. ENGINEER will develop PLC program and OIT graphics prior to factory testing of related control panels provided under this Section. ENGINEER will upload and test PLC program and OIT graphics, in coordination with I&C Subcontractor, as part of the factory acceptance test specified in this Section. ENGINEER will upload final PLC programs and OIT graphics to hardware prior to startup and site testing.

b. Integration of project pump station sites into OWNER's existing remote SCADA System for process monitoring. Integration services include configuration of human machine interface (HMI) graphics, database development, and testing, startup, and training activities associated with configured HMI graphics and database tags. These services will be provided by the ENGINEER.

c. Network Hardware: OWNER will furnish and program network hardware at pump station site for connection to the remote County Network. This network hardware will be limited to one CISCO 1941 router and one CISCO IE4000 managed ethernet switch or similar models as determined by OWNER during construction. OWNER will turn over hardware to CONTRACTOR for installation in network cabinet and control panel as shown and specified. After network hardware is installed and ready for startup-up, CONTRACTOR shall coordinate with OWNER IT and ENGINEER to schedule OWNER IT and ENGINEER for onsite communication testing with remote County Network from pump station.

5. CONTRACTOR with I&C Subcontractor shall coordinate, conduct, and participate in all OWNER Coordination meetings and workshops specified in this Section.

B. Coordination:

1. Instrumentation and Controls:

a. Instrumentation and controls are included in the Work by the instrumentation and controls (I&C) Subcontractor. Programming of control logic and configuring of OIT/HMI software is by ENGINEER. I&C Subcontractor shall coordinate all work with ENGINEER to facilitate programming of PLC logic and development of OIT/HMI graphics.

b. Some panels and equipment are furnished under other Specification Sections under this Contract. CONTRACTOR shall coordinate with the Suppliers of these panels and equipment and the equipment provided by I&C Subcontractor to provide a fully functional system complying with the Contract Documents.

c. Programmable Logic Controller input/output list identifies inputs and outputs required and is part of this Section. Input/output list is for coordinating signals between equipment provided by other Suppliers and process control system I&C Subcontractor, and identifying signals to be

programmed by the ENGINEER. Include Work for CONTRACTOR-furnished control options not on the input/output list at no additional cost to OWNER.

d. The pump station shall have remote connection to County Network. CONTRACTOR shall coordinate with OWNER for new and modified internet and phone service lines. Programming of network router and managed switch is not part of the Work and is by OWNER. CONTRACTOR shall coordinate project schedule with OWNER IT for completion of network hardware programming work and to establish communication with County Network.

2. To centralize responsibility, materials and equipment provided under this Section shall be furnished by a single I&C Subcontractor. With CONTRACTOR, I&C Subcontractor shall assume the responsibility for adequacy and performance of materials and equipment provided under this Section.
3. To the greatest extent possible, provide materials and equipment from a single manufacturer.
4. I&C Subcontractor's Responsibilities:
   a. Preparing all instrumentation and control equipment submittals in accordance with the Contract Documents.
   b. Proper interfacing of instrumentation and control equipment with field equipment, instruments, devices, and panels, including required interfacing with packaged control systems furnished by other equipment Suppliers, and required interfacing with the Site's electrical system.
   c. Review and coordination with manufacturers, Suppliers, and other contracts of Shop Drawings and other CONTRACTOR submittals for equipment, valves, piping, and appurtenances for ensuring proper interfacing of hardware, and locations and installation requirements of inline devices and instrument taps.
   d. Direct, detailed oversight of installation of instruments, panels, consoles, cabinets, wiring and other components, and related wiring and piping connections.
   e. Calibrating, source quality control, field quality control, and start-up of the system.
   f. Responsibility for correction period obligations for instrumentation and control system.
   g. Training of operations and maintenance personnel in operation and maintenance (including calibration and troubleshooting) of the instrumentation and control system.

C. Related Sections:
   1. Section 09 91 00, Painting.
   2. Division 26, Electrical
   3. Section 40 05 05, Exposed Piping Installation.
   4. Section 40 05 19, Ductile Iron Process Pipe.
   5. Section 40 05 31, Thermoplastic Process Pipe.
   6. Section 40 05 53, Process Valves.

1.2 REFERENCES

A. Standards referenced in this Section are:
   1. ANSI/ASQ Z1.4, Sampling Procedures and Tables For Inspection By Attributes.
   2. ASTM A269, Specification for Seamless and Welded Austenitic Stainless-Steel Tubing for General Service.
   3. ASTM A312, Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless-Steel Pipes.
   4. ASTM A403, Specification for Wrought Austenitic Stainless Steel Piping Fittings.
   5. ASTM B88, Specification for Seamless Copper Water Tube.
   6. IEEE 802.1 LAN/MAN Bridging & Management
   7. IEEE 802.1X, Port Based Network Access Control.
   8. IEEE 802.3, Standards Defining Physical Layer and Data Link Layer Media Access Control (MAC) Sublayer of Wired Ethernet
   9. ISA 5.1, Instrumentation Symbols and Identification.
   10. ISA 5.4, Instrument Loop Diagrams.
   11. ISA 20, Specification Forms for Process Measurement & Control Instruments, Primary Elements & Control Valves.
   12. ISO 8802-3, Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications.
   13. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
   14. NFPA 70 (NEC), Article 770, Optical Fiber Cables, and Raceways.
   15. NFPA 79, Electrical Standard for Industrial Machinery.
   16. UL 50, Safety Enclosures for Electrical Equipment, Non-Environmental Considerations.
   17. UL 508A, Industrial Control Panels.
   18. UL 698A, Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations.
   19. UL 2062, Enclosures for Use in Hazardous (Classified) Locations.

1.3 QUALITY ASSURANCE

A. Qualifications:
   1. I&C Subcontractor:
      a. Shall be financially sound with at least five years continuous experience in designing, implementing, supplying, and supporting instrumentation and control systems for wastewater pump stations comparable to the instrumentation and control systems required for the Project, relative to hardware, software, cost, and complexity.
      b. Shall have record of successful instrumentation and control system equipment installations. Upon ENGINEER's request, submit record of

experience listing for each project: project name, owner name and contact information, name and contact information for contractor, name and contact information for engineer or architect, approximate contract value of instrumentation and controls Work for which Supplier was responsible,

c. Shall have at time of Bid experienced engineering and technical staff capable of designing, supplying, implementing, and supporting the instrument and control system and complying with submittal and training requirements of the Contract Documents.
d. Shall be capable of training operations and maintenance personnel in instrumentation and control applications, and in operating and maintaining the control system and equipment.
e. Shall have UL-approved panel shop.

f. The selected I&C Subcontractor shall be one of the following:

1) Aaron Associates of CT, Inc.
2 Matton Road, Waterbury, CT 06708
(203) 753-1536

2) A.K. De Rama Industrial Control Systems, Inc.
253 Sheffield Street, Mountainside, NJ 07092
(908) 789-1600

g. Being listed in this specification does not relieve any potential Supplier from meeting the qualifications specified in this Section.

2. Manufacturer: Manufacturers of instrumentation and control equipment furnished under this Section shall be experienced producing similar equipment and shall have the following qualifications:
   a. Shall manufacture instrumentation and control system components that are fully developed, field-proven, and of standardized designs.
   b. Shall have system of traceability of manufactured unit through production and testing in accordance with ANSI/ASQ Z1.4.
   c. Shall have guaranteed availability clause (99.99 percent, minimum for one year) for microprocessor-based components and appurtenances.
   d. Shall have documented product safety policy relevant to products proposed for the Work.

B. Meetings and Workshops:
   1. General:
      a. Schedule meetings as described herein.
      b. All meetings shall be held at the OWNER's designated location, unless otherwise noted.
      c. An agenda shall be submitted for each meeting specified in this Section a minimum of one (1) week prior to the scheduled meeting date, unless otherwise noted.

2. Network Coordination Meeting:
    a. CONTRACTOR shall reserve time, for one coordination meeting with I&C Subcontractor, OWNER, OWNER's IT, and ENGINEER to review networking and communication requirements for establishing secure communication links between Pump Station site identified in scope of Work and County Network. Each Network Coordination Meeting will be two (2) hours.
3. OIT Graphic and Controls Workshop:
    a. CONTRACTOR shall reserve time, for two workshops with I&C Subcontractor, OWNER, OWNER's Operations Personnel, and ENGINEER to review OIT graphics and control strategy. All comments provided by OWNER shall be incorporated at no additional cost to OWNER. Each OWNER Operations Coordination Meeting will be two (2) hours and shall be completed prior to factory acceptance testing of control panel.
4. SCADA System HMI Graphics Workshop:
    a. CONTRACTOR shall reserve time, for two workshops with OWNER, OWNER's Operations Personnel, and ENGINEER to review proposed HMI graphics prior to pump station startup and testing. All comments provided by OWNER shall be incorporated at no additional cost to OWNER. Each SCADA System HMI Graphics Workshop will be two (2) hours and shall be completed prior to pump station startup.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
    1. Qualifications Statement:
        a. Qualifications Submittal shall include detailed information to show compliance with the Quality Assurance requirements of this Section. Failure to meet the minimum requirements shall be grounds for rejection. Refer to Article 1.3 for requirements.
        b. The Qualifications Submittal, at a minimum shall contain the following:
            1) Copies of ISA CCST Level 1 certificates for all field technicians or resumes demonstrating comparable field experience. The names and home office location of the technicians located within 75 miles and within 2 hours travel time of the project site shall be provided.
            2) Notarized statement from the firm's financial institution demonstrating ability for the firm to meet the obligations necessary for the performance of the work.
            3) Copy of UL-508 certificate for panel fabrication facilities.
            4) Project references for wastewater projects as defined in the Quality Assurance paragraphs.
            5) Sufficient documentation to demonstrate the I&C Subcontractor's capabilities to complete this project including resumes of key staff, details on engineering, design, fabrication, and field service capabilities.

2. Shop Drawings:
   a. Field Instruments: Submit the following:
      1) All field Instruments furnished under this Contract shall be provided under one shop drawing cover to facilitate ease of review. Include table of contents. Provide a separate section for each instrument type. Provide a cover page for each section which shall contain the following information at minimum: Instrument type and instrument tag number(s).
      2) Bill of Materials:
         a) Bill of Materials shall be provided at the beginning of shop drawing package.
         b) Provide a complete list of all proposed Instruments and components in one Bill of Materials and title "Instrumentation Bill of Materials".
         c) Bill of Materials shall be in table format and shall include the following for each line item: line-item number, instrument tag number, functional name or description, manufacturer's name, complete model number, quantity provided, and shop drawing section number or reference location.
      3) Submit the following for each field instrument:
         a) Manufacturer's product name and complete model number of devices proposed for use, including manufacturer's name and address.
         b) Instrument tag number in accordance with the Contract Documents.
         c) Data sheets and manufacturer's catalog literature. Provide data sheets in accordance with ISA 20 and annotated for features proposed for use. For instruments not included in ISA 20, submit data sheets using a format similar to ISA 20.
         d) Description of construction features.
         e) Performance and operation data.
         f) Installation, mounting, and calibration details; instructions and recommendations.
         g) Service requirements.
         h) Dimensions of instruments and details of mating flanges and locations of closed tanks, pipe sizes for insertion instruments, and upstream/downstream straight run pipe lengths required.
         i) For instruments installed in stilling wells, provide complete details of stilling well construction and installation including materials of construction, to scale drawings with dimensions, details on project specific location for installation, and coordination of sizing for compliance with functional requirements. Details of stilling well shall be submitted with the associated instrument submittal.
         j) Range of each device and calibration information.
         k) Descriptions of materials of construction and listing of NEMA ratings for equipment.

b. Panels and Cabinets: Submit the following:
    1) Each submittal shall be a complete package and include all components, drawings, and information required for the panel/cabinet.
    2) Submit a cover page that lists, at a minimum, date, specification number(s), panel/cabinet name in accordance with the Contract Documents, and location. Preferred format for the cover page is ISA S20, general data sheet; however, other formats will be acceptable provided they contain all required information.
    3) Submit the following for each panel/cabinet:
        a) Panel/cabinet name as specified.
        b) Bill of materials for all panel/cabinet components, including enclosure and components mounted in or on the enclosure. Bill of materials shall include: tag number or reference number, functional name, manufacturer's name, model name, manufacture's complete part number, and quantity of item.
        c) Evidence that panel shall be constructed in conformance with UL requirements and bear the UL seal confirming the construction. All costs associated with obtaining the UL seal and any inspections shall be borne by the CONTRACTOR. New factory-built subpanels for installation inside existing panels are not required to bear UL seal.
        d) Equipment ventilation requirements and calculations substantiating panel/cabinet heating and cooling provisions proposed.
        e) Panel/cabinet component product information.
        f) Panel/cabinet layout drawings.
        g) Panel/cabinet wiring diagram drawings.
        h) Panel/cabinet network diagram drawings.
    4) Component product information shall include:
        a) Manufacturer's catalog literature and annotated for features proposed for use.
        d) Description of construction features.
        c) Performance and operation data. For panels with uninterruptable power supply systems, provide load calculations showing compliance to rating requirements.
        d) Installation and mounting details; instructions and recommendations.
        e) Service requirements.
        f) Warranty.
    5) Layout drawings shall include:
        a) Front, rear, and internal views to scale with dimensions.
        b) Tag number and functional name of components mounted in and on panel or cabinet, as applicable.
        c) Materials list with numbered call-outs for identification of components.
        d) Nameplate location(s) and legend including text, letter size and

colors to be used.

e) Location of anchorage connections.
f) Location of external wiring and piping connections.
g) Mounting and installation details, coordinated with actual application.
h) Proposed layouts and sizes of operator interface graphic display panels.
i) Subpanel layouts and mounting details for items located inside panels/cabinets.
j) Plan view of panel showing door clearance requirements are met. Indicate any potential clearance issues with surrounding hardware, equipment, or environment.
k) Detail showing anchorage plan of wire bundles between subpanels and front panel mounted devices.
l) Detail drawings showing PLC module arrangement. Include processor, I/O cards, power supplies, and network cards, as applicable. Identify rack numbers, slot numbers, and module type.
m) Detail drawings showing terminal block arrangement, location, and numbering scheme.

6) Wiring diagram drawings shall include:
   a) Name of each panel or cabinet.
   b) Wire sizes and types.
   c) Pipe sizes and types.
   d) Terminal strip and terminal numbers.
   e) Wire color coding.
   f) Functional name and manufacturer's designation for components to which wiring and piping are connected.
   g) Lightning and surge protection grounding. Coordinate with Electrical Drawings for compliance.
   h) Electrical control schematics in accordance with NFPA 79. Control schematic shall be in accordance with convention indicated in Annex D of the NFPA 79. Standardized wiring diagrams that do not accurately reflect actual wiring to be furnished are unacceptable. Tables or charts for describing wire numbers are unacceptable.
7) Network diagram drawings shall include:
   a) Detailed diagram showing networked system hardware and identifying model numbers of system components. Include all network components in diagram.
   b) Interconnection details, including termination details, cable identification, and port numbers.

c. Loop Wiring Diagrams: Submit the following: Prepare on a module-by-module basis:
   1) Rack numbers, slot number, module type, and module terminal point numbers. Include location and identification of intermediate panel and field terminal blocks and terminal numbers to which I/O

wiring and power supply wiring is connected. Identify power supply circuits with designation numbers and ratings.
2) Wiring types, wire numbers, and color coding.
3) Designation of conduits in which field I/O wiring will be installed.
4) Location, functional name, tag numbers and manufacturer's module numbers of panel and field devices and instruments to which I/O wiring will be connected.
5) Prepare loop wiring diagrams in accordance with ISA 5.4.

d. Complete point-to-point interconnection wiring diagrams of field wiring associated with the system. Diagrams shall include the following:
1) Field wiring between each equipment item, panel, instruments, and other devices, and wiring to control stations, panelboards, and motor starters. Some of this equipment may be specified in other Divisions, CONTRACTOR is responsible for providing complete point-to-point interconnection wiring diagrams for control and monitoring of that equipment.
2) Numbered terminal block and terminal identification for each wire termination.
3) Identification of assigned wire numbers for interconnections. Assign each wire a unique number.
4) Schedule showing the wiring numbers and the conduit number in which the numbered wire is installed.
5) Junction and pull boxes through which wiring will be routed.
6) Identification of equipment in accordance with the Contract Documents.

2. Product Data:
a. Product data for field instruments in accordance with requirements for Shop Drawings in this Section.
b. Product data for panels and cabinets in accordance with requirements for Shop Drawings in this Section.
c. Product data for field wiring and piping provided for instrumentation and control service and not included under other Sections or contracts.
d. Product data for process control system, including software and hardware. Requirements for software product data are included in requirements for Shop Drawings under this Section.

3. Factory Acceptance Test Plan:
a. The Factory Test Plan shall be submitted and approved prior to schedule start of factory test.
b. Factory Test Plan shall include:
1) Information on equipment to be tested.
2) Proposed test dates.
3) Expected duration of test.
4) Location where factory test will be conducted.
5) List of required testing equipment.
6) Test procedure forms.
c. Test procedure forms shall include at minimum:
1) Cover sheet with test summary.

2) Detailed descriptions for each test to be performed. Each test to be performed shall be described and a space provided after it for sign-off by the appropriate parties after its satisfactory completion.
3) Checklists to be used to control and document the required tests. Provide a check box for every step to be performed during the test.
4) Sign-off areas where applicable.
5) Area for additional notes.
6) Include "punch list" forms with the test procedures to document issues that arise during the testing. Punchlist forms, at a minimum, shall include a specification cross reference; an issues description field; a resolution description field; and a sign-off area for the appropriate parties.

d. Test procedures shall be provided for the following:
1) Visual inspection of components and assembly.
2) Hardware operational testing.
3) Software demonstration.

4. Factory Acceptance Test Report:
a. Within 7 days after completion of the factory acceptance test, submit the completed Factory Acceptance Test Report.
b. The test report shall include a copy of the signed off test procedure forms. Testing shall not be considered complete until the signed test procedure forms have been submitted and favorably reviewed. Submittal of other test documentation, including "highlighted" wiring diagrams with technician notes, are not acceptable substitutes for the formal test documentation.

5. Start-up and Field-Testing:
a. Input/Output Status Sign-Off Forms:
1) I/O Status Sign-Off Forms shall be used to organize and track a system's inspection, adjustment, and calibration.
2) Submit separate Input/Output Status Sign-Off Form for each system.
3) The form shall include a table based on the project I/O list. The table shall include the following columns at minimum:
a) PLC Name
b) Signal Tag
c) Description
d) Range or active state when event or alarm stat is reversed
e) Drawing Reference
f) Signal Type
g) Rack number
h) Slot number
i) Channel number.
j) Instrument Alarm Setpoint
k) Calibration, Configuration, and Wiring Complete (signoff area) with Date
l) I/O Testing from the field to the OIT (signoff area) with Date
m) I/O Testing from the field to the HMI (signoff area) with Date

B. Informational Submittals: Submit the following:
   1. Documents to be submitted prior to pre-construction conference.
   2. Manufacturer's Instructions:
      a. Shipping, handling, storage, installation, and start-up instructions.
   3. Source Quality Control Submittals:
      a. Factory test reports and results.
   4. Special Procedure Submittals:
      a. Submit notification to OWNER and ENGINEER at least 14 days before readiness to begin system checkout. Schedule system checkout on dates agreed to by OWNER and ENGINEER.
      b. Submit written procedure for system checkout to ENGINEER three months prior to starting system checkout. Three months prior to starting system checkout submit written procedure for start-up to ENGINEER.
   5. Field Quality Control Submittals:
      a. Submit the following prior to commencing system checkout and start-up.
         1) Completed calibration sheets for each installed instrument showing five-point calibration (0, 25, 50, 75, 100 percent of span), signed by factory-authorized serviceman.
      b. Field calibration reports
      c. Field testing reports.
   6. Reports:
      a. Installation inspection and check-out report.
      b. Submit written report of results of each visit to Site by Supplier's service technician, including purpose and time of visit, tasks performed, and results obtained. Submit within two days of completion of visit to the Site.
   7. Qualifications Statements:
      a. I&C Subcontractor.
      b. Manufacturer, when required by ENGINEER.

C. Closeout Submittals: Submit the following:
   1. Operations and Maintenance Data:
      a. Submit in accordance with Section 01 78 23, Operation and Maintenance Data.
      b. Include complete up-to-date system software documentation. Provide hardcopy and electronic copies.
      c. Include acceptable test reports, maintenance data and schedules, description of operation, wiring diagrams, and list of spare parts recommended for one year of operation with current price list.
      d. As-built Drawings:
         1) Submit complete as-built drawings, including all drawings and diagrams specified in this section under the "Submittals" section. These drawings shall include all termination points on all equipment the system in connected to, including terminal points of equipment provided by other suppliers.

2) As-built documentation shall include information from submittals, as described in this Specification, updated to reflect the as-built system. Any errors in or modifications to the system resulting from the Factory and/or Functional Acceptance Tests shall be incorporated in this documentation.
3) Provide electronic copies of drawings in native file format and Portable Document Format (PDF).
4) As-Built Drawing submittal shall include a copy of the actual redlined drawings and other documents generated during factory test, field start up, and testing of the system.

2. Record Documentation:
   a. Prepare and submit record documents in accordance with Section 01 78 39, Project Record Documents.
   b. Revise all system Shop Drawing submittals to reflect as-built conditions in accordance with the following.
      1) Two copies of each revised Shop Drawings and documentation to replace outdated drawings and documentation contained in operation and maintenance manuals. Submit half-size black line drawings for each drawing larger than 11 inches by 17 inches. Include specific instructions for outdated drawing removal and replacement with record documents submittal.
      2) Half-size black line prints of wiring diagrams applicable to each control panel shall be placed in clear plastic envelopes and stored in a suitable print pocket or container inside each control panel.
      3) Submit CADD drawings of the point-to-point interconnection wiring diagrams updated to reflect final as-built equipment information and as-installed field installation information.

D. Maintenance Materials Submittals: Submit the following:
   1. Spare Parts and Test Equipment:
      a. Prior to furnishing spare parts and test equipment, submit a Spare Parts and Test Equipment Bill of Materials for all proposed tools, spare parts, and consumables for review and approval. Bill of Materials shall be in table format and shall include the following for each line item: line-item number, functional name or description, manufacturer's name, complete model number or manufacturer part number, quantity proposed, and related shop drawing section number or reference location.
      b. After approval of Spare Parts and Test Equipment BOM, furnish the spare parts and test equipment as specified in this Section.
         1) Spare parts shall be packed in containers suitable for long term storage, bearing labels clearly designating the contents and the pieces of equipment for which they are intended.
         2) Provide source quality control for spare parts as part of factory testing prior to shipment of instrumentation and control equipment.
         3) For process sensors and other analog instruments, Supplier shall submit a separate quotation for recommended list of spare parts and test equipment. Separately list and price each item

recommended. Spare parts quotation shall include a statement that prices quoted are valid for a period of one year from date of equipment installation and that Supplier understands that OWNER reserves the right to purchase none, any, or all parts quoted. Upon request, Supplier shall submit documentation that stock of spare parts and test equipment is obtainable within 48 hours of receipt of OWNER's order.

1.5 STORAGE AND HANDLING

A. Prior to packaging, each manufacturer or Supplier shall securely attach tag number and instructions for proper field handling and installation to each instrument.

B. Comply with Section 01 65 00, Product Delivery Requirements, and Section 01 66 00, Product Storage and Handling Requirements.

1.6 WARRANTY

A. General Warranty: The special warranties specified in this Article shall not deprive OWNER of other rights or remedies OWNER may otherwise have under the Contract Documents and shall be in addition to and run concurrent with other warranties made by CONTRACTOR under the Contract Documents.

B. Special Warranties:
   1. Two-year extended warranty that includes parts and labor for PLC components. Warranty period shall start after completion of the Instrumentation and Control System Field Test and from the date the PLC hardware is accepted by OWNER.

PART 2 – PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Power Supplies:
   1. Electrically powered equipment and devices shall be suitable for operation on 115-volt plus-or-minus 10 percent, single-phase, 60 Hertz plus-or-minus two Hertz, power supply. If different voltage or closer regulation is required, provide suitable regulator or transformer at no additional cost to OWNER.
   2. Provide appropriate power supplies for field instruments requiring power source less than 115 volts. Power supplies shall be mounted in control panels or enclosures installed near associated instrument or in field panels.
   3. Power supplies shall be capable of minimum of 130 percent of maximum simultaneous current draw.
   4. Provide power on-off switch or air circuit breaker for each item provided under this Section that requires electric power.

B. Signal Requirements:
   1. Control system shall use four to 20mA DC analog signals, unless otherwise shown or indicated.
   2. Provide signal converters and repeaters where required. Adequately size power supplies for signal converters and repeater loads.
   3. Isolate signals from ground.
   4. Signals transient DC voltage shall not exceed 300 volts over one millisecond and shall not have a dc component over 300 volts.
   5. Discrete signals shall use 24VDC.

C. Surge Protection Requirements:
   1. Provide surge protection to protect electronic instrumentation and control systems from surges propagating along signal and power supply cabling. Protection systems shall be such that the protection level shall not interfere with normal operation, but shall be lower than instrument surge withstand level, and be maintenance-free and self-restoring.
   2. Provide instruments in suitable metallic cases, properly grounded. Ground wires for surge protectors shall be connected to good earth ground and, where practical, run each ground wire individually and insulated from other wires. Mount protectors within instrument enclosure or in separate junction box compatible with the area designation coupled to the enclosure.
   3. Surge suppression shall be provided for all circuits, AC and DC, running between or outside buildings.
   4. Surge suppression shall be installed at each end of circuit requiring surge suppression and at the entrance of power feed to all Control Panels.
   5. Power Circuits:
      a. Lightning and surge protection devices shall be standard manufactured products comprising multi-component networks or hybrid circuits. The units shall incorporate gas filled discharge tubes, and Zener diodes providing full protection from line to line and from line to ground. Units shall be din-rail mounted, rated for a 10KA maximum surge current and voltage suitable for the type of circuit being protected. Reaction time shall be in the order of nanoseconds.
      b. The electrical power system shall be protected from voltage surges at the power service point, and other point within the electrical system as noted, in the form of a UL-1449 listed surge suppressor with a 25-year manufacturer's performance warranty.
   6. Products and Manufacturers: Provide one of the following:
      a. Weidmuller, TVSS Series.
      b. Or Equal.

D. Miscellaneous:
   1. General:
      a. Instrumentation components shall be heavy-duty types, constructed for continuous service.
      b. System shall consist of equipment models currently in production.

c. Materials and equipment, including cabling and interconnections, shall be in accordance with Division 26, Electrical, and manufacturer's recommendations, unless indicated otherwise in the Contract Documents.
d. Materials and equipment shall, where applicable, be in accordance with UL standards and be so marked and labeled.

2. Logic and control loops shall be fail-safe. Instrumentation components shall return automatically to accurate measurement within 15 seconds upon restoration of power after power failure and when transferred to standby power supply.
3. Provide surge protection for instruments and other control system components that could be damaged by electrical surges. Provide lightning arresters on both ends of communication lines, except for fiber optic cabling, external to buildings or structures, including leased telephone lines and similar communication lines.
4. Field-mounted instruments and system components shall be constructed for use in humid and corrosive service conditions. Field-mounted instrument enclosures, junction boxes and appurtenances shall have NEMA rating appropriate for hazardous rating requirements shown or indicated on Electrical Drawings, this Section, and elsewhere in the Contract Documents.
5. Miscellaneous hardware such as fittings, fasteners, and screws, be Type 316 stainless steel or other appropriate material to prevent galvanic reactions and shall be suitable for service intended. Piping stands shall be provided for fastening instruments as required. Provide threaded pipe stands with flange bolted to slab. Use carbon steel piping and flanges painted in accordance with Section 09 91 00, Painting.
6. Data processing equipment and relays with interconnections to field devices shall be wired through field wiring terminal blocks in the panel. Terminals as part of relay base are unacceptable.
7. Arrange panel-mounted instruments, switches, and other devices ergonomically for functional use and ease of maintenance. Similar types of panel-mounted devices shall be by one same manufacturer and of the same model line.
8. Equipment furnished shall be of modular construction and be capable of field expansion through installation of plug-in circuit cards and additional cabinets as necessary.
9. Field- and panel-mounted instruments shall be tagged with equipment number and nomenclature indicated in the Contract Documents; if not so indicated, tag in accordance with approved Shop Drawings.
10. Coordinate ranges and scales specified in the Contract Documents with manufacturer of the equipment actually furnished for operability over the intended range. Complete the coordination prior to submitting Shop Drawings to ENGINEER.
11. Treat field-mounted devices with anti-fungus spray.
12. Protect field-mounted devices from exposure to high and freezing temperatures to provide complete operability under the environmental conditions indicated in the Contract Documents.

E. Environmental Conditions:
   1. Provide control system suitable for continuous operation under the following conditions:
      a. Indoor Instruments:
         1) Ambient Temperature: Zero degrees F to 120 degrees F.
         2) Relative Humidity: 100 percent, maximum.
      b. Outdoor Instruments
         1) Ambient Temperature: -15 degrees F to 120 degrees F.
         2) Relative Humidity: 100 percent, maximum.
   2. Protect outdoor-mounted field instruments from direct sunlight by providing sunshade for instruments. Construct sunshade out of non-corrosive material. Sunshade shall withstand wind velocity of 120 miles per hour.

2.2 PROCESS TAPS, SENSING LINES, AND ACCESSORIES

A. Water Pressure Sensing Lines and Accessories for Flow and Pressure Transmitters:
   1. Material: Copper water tubing, ASTM B88, Type L, drawn temper or annealed.
   2. Pressure Rating: Same as connecting pipe.
   3. Size: 1/2-inch O.D. for water.
   4. Connections: Brass compression type.
   5. Shut-off Valves:
      a. Type: Ball.
      b. Pressure Rating: Same as connecting pipe.
      c. Body, Ball, and Stem: Brass.
      d. Packing: High-density Teflon.
      e. Handle: Nylon with metal travel stops.
      f. Support Rings: TFE coated brass.
      g. End Connections: Removable.
   6. Manifolds:
      a. Type: Five-valve and three-valve meter manifolds.
      b. Materials: Type 316 stainless steel body, bonnets, and stems; delrin seats; Teflon packing.
      c. Manufacturers: Provide products of one of the following:
         1) Anderson-Greenwood.
         2) Swagelok by Crawford.
         3) Or equal.

B. Air Pressure Sensing Lines and Accessories for Air Flow/Pressure Transmitters:
   1. Material: Type 316 stainless steel tubing, ASTM A269, medium wall thickness.
   2. Pressure Rating: Same as connecting pipe.
   3. Size: 3/8-inch OD for air.
   4. Connections: Type 316 stainless steel compression type.
   5. Shut-off Valves:

a. Type: Ball.
b. Pressure Rating: Same as connecting pipe.
c. Body, Ball and Stem: Type 316 stainless steel.
d. Packing: High density Teflon.
e. Handle: Nylon with metal travel stops.
f. Support Rings: Teflon coated Type 316 stainless steel.
g. End Connections: Removable.
h. Products and Manufacturers: Provide one of the following:
    1) Whitey Valves.
    2) Anderson Greenwood.
    3) Or equal.

6. Manifolds:
    a. Type: Five-valve and three-valve meter manifolds.
    b. Materials: Type 316 stainless steel body, bonnets and stems; delrin seats; Teflon packing.
    c. Products and Manufacturers: Provide products of one of the following:
        1) Anderson-Greenwood.
        2) Swagelok.
        3) Or equal.

C. Pressure Tap Sensing Lines and Accessories for Pressure Gauges and Pressure Switches:
    1. For Process Sensing Taps in Ductile Iron, Steel and Stainless-Steel Piping Systems:
        a. Material and Fittings: Type 304 stainless steel pipe, ASTM A312; and threaded fittings and adapters, ASTM A403.
        b. Sizes: 1/2-inch diameter minimum for main sensing piping and 1/4-inch diameter gauge and switch connections.
        c. Pressure Rating: Equal to or greater than the applicable system test pressure as specified in the Contract Documents.
        d. Accessories:
            1) For applications not requiring diaphragm seals, provide separate 1/2-inch diameter Type 316 stainless steel threaded ball valve for each gauge and switch.
            2) For applications requiring diaphragm seals, provide separate 1/2-inch diameter threaded Type 316 stainless steel ball valve for seal process side shutoff.
    2. For Process Sensing Taps in Copper and Thermoplastic Piping Systems:
        a. Pipe Material and Fittings: Use same type of pipe material and fittings as that used in the process piping system. Provide PVC and CPVC piping in accordance with Section 40 05 31, Thermoplastic Process Pipe.
        b. Sizes: 1/2-inch diameter minimum for main process sensing piping and 1/4-inch diameter for gauge and switch connections.
        c. Pressure Rating: Equal to or greater than the applicable system test pressure as specified in the Contract Documents.
        d. Accessories:
            1) For copper piping system taps with or without seals, provide

separate 1/2-inch diameter minimum threaded brass or bronze ball valve for each gauge and switch.

2) For PVC and CPVC piping systems with or without diaphragm seals, provide separate 1/2-inch diameter threaded ball valve for process sensing line shutoff.

2.3 LEVEL MEASUREMENT SYSTEM – BUBBLER TYPE (PACKAGED SYSTEM)

A. Type: The bubbler shall operate on the principle of continuously discharging a constant flow of air into an open-ended dip tube installed in the vessel. A constant rate of flow regulator maintains air in the tube with enough pressure to continuously bubble out of the open end. The air back pressure measured with a differential pressure transmitter is equal to the head of the process liquid above the bottom of tube. Bubbler level system shall be as described below. All the components of the bubbler system including stilling well, dip tube, etc. will be provided by CONTRACTOR.

B. Minimum requirements for all bubbler systems shall be as follows:
1. Accuracy: ±0.5 percent or range.
2. Sensitivity: 0.02 percent of range.
3. Repeatability: 0.1 percent of range.
4. Ambient Temperature Rating: -30 degrees F to 170 degrees F.
5. Thermal Sensitivity: 0.01 percent per deg. F.
6. Power Requirements: 120 vac, 60 Hz.
7. Output: 4 to 20 mADC.
8. Power Excitation: 24 VDC.
9. Enclosure: NEMA 4.
10. All dip tubes shall be notched at bottom with an angular cut to minimize errors by keeping air bubbles continuous.
11. Air supply flow rate shall be adjustable from one to four scfm.
12. All external connections shall be via 1/2-inch NPT stainless steel bulkhead tube connectors to bubbler panel.
13. The length of dip tube and tubing from bubbler to dip tube shall be verified by CONTRACTOR for each installation.
14. Material and size of the dip tube and tubing to the bubble panel shall be as shown.
15. All components of the bubbler system shall meet requirements of this Section as to field and panel mounted instruments and control panels.

C. System shall include the following features as a minimum:
1. Pressure regulator.
2. Flow regulator.
3. Filter/coalescing water tap.
4. System pressure gauge.
5. Precision transducer.
6. Plate mounting fully wired, labeled, tested.

7. Rotameter for gas purge rate.
8. Manually activated blowdown valving.
9. 3-1/2 digit LED type level display indicator.
10. Pressure switches with adjustable setpoints for remote high, high-high, low, low-low alarms as shown.
11. On-off switch.
12. Manual pushbutton activated, and automatic timer activated purge solenoids.
13. Loss of air alarm.
14. Clogged dip tube alarm.
15. Accumulator (two gallon) Tank.
16. Front window.
17. NEMA 4X stainless steel enclosure.
18. Shall be customized to applications as a turnkey system.
19. Purge cycle shall be adjustable and be capable of providing daily and monthly purge options in addition to other increment settings.
20. Analog 4 to 20 mADC output signal shall be held at its last level during a purge. Purge duration shall be field adjustable (0 to 60 sec.).

D. Products and Manufacturers: Provide the following:
1. Digital Control Company, Model 12138-2.

2.4 LEVEL SWITCH - FLOAT TYPE

A. Type: Direct acting, pear shaped, eccentric weighted, displacement type liquid level sensor.

B. Construction Features:
1. Float Body: Hollow hermetically sealed, rigidly molded of polypropylene containing mechanical switch and eccentric metal weight.
2. Mechanical Switch: SPDT switch rated 16 amps resistive at 120 VAC and five amps resistive at 30 VDC.
3. Weight: Weight to cause sensor to hang straight down from cable when not immersed and only allow float to pivot when immersed in liquid.
4. Electrical Cable:
   a. Heavy duty, three conductor, flexible and submersible cable, sheathed in PVC and connected to float and switch with watertight seal.
   b. Length furnished to be sufficient to extend to junction box.

C. Products and Manufacturers: Provide one of the following:
1. Flygt, Model ENM-10.
2. Or equal.

2.5 LEVEL SWITCHES - MULTIPOINT FLOAT TYPE

A. Type: Float tree with multiple float switches mounted to a common anchor assembly.

B. Performance Requirements:
   1. Operating Temperature: 40 to 140 degrees F.

C. Construction Features:
   1. Number of Floats: Five per assembly.
   2. Float Body: Hollow hermetically sealed, rigidly molded of polypropylene containing mechanical switch and eccentric metal weight.
   3. Mechanical Switch: SPDT switch rated 16 amps resistive at 120 VAC and five amps resistive at 30 VDC.
   4. Electrical Cable:
      a. Heavy duty, three conductor, flexible and submersible cable, sheathed in PVC and connected to float and switch with watertight seal.
      b. Length furnished to be sufficient to extend to junction box plus excess length to permit re-position of floats and removal of float tree assembly for maintenance without disconnecting wires. Cable length requirements shall be field verified and coordinated with ENGINEER. Submit proposed cable length of each float tree assembly along with verified field conditions for review and approval.
   5. Support Rod Length: 12-feet; Longer length may be required. Final length to be field verified and coordinated with ENGINEER.
   6. Mounting Hardware: 316 SS.
   7. Area Classification: Class I, Div 1

D. Provide all required mounting hardware, cable ties, and appurtenances as shown, specified, and required to install assembly and permit relocation of assembly between wet wells. Provide stilling wells and all required hardware as shown and specified for installation of assembly.

E. Float Switch Activation Level: Initial settings as shown on Contract Drawings. Final activation levels to be field verified and coordinated with ENGINEER and OWNER.

F. Products and Manufacturers: Provide one of the following:
   1. Flygt, Model ENM-10.
   2. Or equal.

2.6 LEVEL TRANSMITTER – SUBMERSIBLE PRESSURE TRANSDUCER

A. Type: Measuring level by continuously measuring hydrostatic pressure via its sensing element, an ion implanted silicon semiconductor chip. Data is transmitted by an analog, 4 to 20 mADC output signal.

B. Performance Requirements:
   1. Range: 0-15 feet.
   2. Accuracy: ±0.25 percent full scale.
   3. Zero Offset: ±0.50 percent full scale.

4. Span: ±0.50 percent full scale.
5. Temperature Ranges: -40 to 176 degrees F.

C. Construction Features:
1. Suitable was wastewater applications.
2. Diaphragm: Type 316L stainless steel with large diameter bird cage to protect diaphragm suitable for wastewater applications.
3. Housing: Type 316 stainless steel.
4. Output Signal: 4-20mADC
5. Power supply: 12 to 28 VDC with surge and lightning protection.
6. Electrical Connection: Attached 3-wire, 20-gauge polyethylene shielded unspliced cable. Cable shall be provided of required length and fully submersible construction.
7. Lightning and surge protection.
8. Area classification: Class I, Div 1.
9. Mounting: 316 stainless steel suspension cable.
10. Panel mounted meter shall be factory calibrated for required range, shall accept 4 to 20 mADC input, shall have a 3-1/2 digit LED display in feet of water, shall be NEMA 4X rated, and have two relay outputs and analog 4 to 20 mADC output.

D. Provide all required mounting hardware and appurtenances. Provide stilling well and all required hardware as shown and specified for installation of sensor. Provide cable ties and appurtenances as shown to secure sensor to suspension cable.

E. Provide manufacturer 2-year warranty.

F. Manufacturers: Provide products of one of the following:
1. Mercoid a division of Dwyer Instruments
2. Or approved equal.

2.7 FLOW METER - MAGNETIC FLOW TUBE

A. Type: Flowtube with pulsed DC Magnetic Flow Transmitter.

B. Function: Monitor liquid flows as shown and as specified. The transmitter shall display the monitored flow value and shall output a 4 to 20 mADC signal proportional to the monitored flow.

C. Performance Requirements:
1. Range: 1430 and 1510 GPM.
2. Local Indication: 1430 and 1510 GPM.
3. Accuracy (with analog output):
a. ±0.5 percent of flow rate, or better, over a range from 1 fps to 31 fps.
b. ±0.005 fps, or better, at flows below 1 fps.

c. Accuracy unaffected by changes in fluid velocity, density, pressure, temperature or conductivity (above minimum conductivity limits).
d. System accuracy shall be proven by submittal of flow test curves of the actual meters being furnished.
1) Test curves shall show a minimum of ten equally spaced flow points. Tests shall be performed using water and a weight or volume tank. A "master meter" used as a reference standard is not acceptable. The test setup shall be submitted and approved prior to testing.

4. Repeatability: ±0.15 percent of flow rate, or ±0.0015 fps, whichever is greater.
5. Drift: Complete zero stability.
6. Minimum Fluid Conductivity Limit: Five microsiemens per centimeter or less.
7. Minimum Pre-amp Input Impedance: 1012 ohms.
8. Power:
a. 120 VAC ± 10 percent, 60 Hz, ±3 Hz power supply.
b. Power Consumption shall not exceed 50 watts for flow tube and transmitter combined.
9. Output:
a. 4 to 20 mADC, direct acting and isolated, into 0 to 1000 ohms.
b. High accuracy, field adjustable scaled pulse output (0.1 to 10 Hz or greater) to drive local totalizer.
10. Operating Temperature: Suitable for operation with process fluid temperature from 0° to 140°F.
11. Pressure Rating: Greater than or equal to test pressure specified in Section 15052, Exposed Piping Installation, for appropriate piping system.

D. Construction Features
1. Flow tube:
a. Type: Lined metal flow tubes.
b. Interchangeability: Ratio of flow velocity to voltage reference signals generated identical for all meter sizes to permit interchangeability with transmitter without requiring circuit modifications.
c. Tube Material: Type 304 stainless steel.
d. Electrode:
1) Conical or elliptical shaped.
2) Material: To be compatible with the process fluid.
e. Lining: To be compatible with the process fluid.
2. Enclosure:
a. Materials and Rating:
1) Cast low-copper aluminum alloy or fabricated sheet steel.
2) NEMA 6 rated.
3) Capable of withstanding accidental submergence in 30 feet of water for 48 hours

b. Finish: Finish exterior, except for flange faces, with a high build epoxy paint.
c. End Connections: ANSI Class 150 suitable for mating with pipe specified.
d. Electrical Connections: 3/4-inch NPT tapped holes for power conduit fitting and signal conduit fittings.

3. Pulsed DC Magnetic Flow Transmitter:
   a. Materials and Rating:
      1) Die cast, low-copper aluminum alloy.
      2) NEMA 4 rated.
   b. Solid state construction.
   c. Local Indication:
      1) 3-1/2-digit minimum LCD meter with field selectable engineering units.
      2) Seven-digit electromechanical totalizer or eight-digit electronic LCD totalizer with reset and lithium battery backup. Totalizer shall be integral with transmitter and visible through viewing window or shall be externally mounted in a separate NEMA 4X enclosure or condulet with viewing window and installed adjacent to the transmitter.
   d. Pulse and analog outputs galvanically isolated from input and earth ground.
   e. Automatic zeroing feature making it unnecessary to zero the instrument before or after placing it in operation.
   f. Pre-calibrated span adjustment providing continuous span adjustment over entire range.
   g. Range Adjustment: Direct reading thumbwheel switches or calibrated potentiometer, continuously adjustable for full scale settings from 1 to 31 feet per second.
   h. Signal Conditioning: Adjustable damping circuit with response times of 1 to 25 seconds minimum.
   i. Low Flow Cutoff: Provide automatic low flow cutoff circuitry to stop pulse output and local totalization when flow drops below 0.5 percent ± 0.2 percent of the calibrated upper range valve.

E. Accessories:
   1. Mounting:
      a. Provide complete Type 316 stainless steel mounting hardware.
      b. All transmitter and driver electronics shall be remotely mounted from the flow tubes at locations shown.
      c. Type of mounting (wall, support frame or pipe stand) as required.
   2. Shielded cable assemblies of sufficient length for connection between flow tube and transmitter electronics.
   3. Type 316 stainless steel grounding rings for flow tubes.
   4. Type 316 stainless steel grounding straps.
   5. NEMA 4X rated 120 VAC power on-off selector switch. Provide Allen Bradley 800H rosite glass polyester enclosure, or Equal.

F. Products and Manufacturers: Provide one of the following:
   1. Foxboro by Schneider Electric, 2800 Series magnetic flow tubes and E96 Pulsed DC Magnetic Flow Transmitter.
   2. Krohne America, Incorporated, Altoflux M900 Series magnetic flow tubes and Model SC100 AS Signal Converters.
   3. ABB, Magmaster.
   4. E&H, Promag 53.
   5. Or equal.

2.8 PRESSURE GAUGE – BOURDON TUBE

A. Type: Bourdon Tube Pressure Element Type, Liquid Filled Gauge (for pressure ranges of 15 psi and greater and vacuum ranges to 30-inches Hg).

B. Performance Requirements:
   1. Range:
      a. Suction: 25 feet of water above and below zero.
      b. Discharge: 0 feet to a minimum of 5 feet of water pressure above pump shutoff.
   2. Accuracy: ±0.5 percent of span (ANSI B40.1 Grade 2A).

C. Construction Features:
   1. Case:
      a. Solid front design constructed of glass filled polyester.
      b. Color: Black.
   2. Size: 4-1/2-inch.
   3. Ring: Threaded, glass filled polyester.
   4. Window: Glass.
   5. Dial: White with black markings.
   6. Filling Liquid: Use silicone except for process fluids containing chlorine. When the process fluid contains chlorine, the filling liquid shall be Halocarbon 63 or Flurolube 63.
   7. Overpressure protection: Full blowout back.
   8. Bourdon Tube and Socket:
      a. Type 316 stainless steel.
      b. Heliarc welded, unless otherwise specified.
   9. Movement:
      a. Type 300 series stainless steel.
      b. Rotary geared with Teflon S coating, or cam and roller type.
      c. Built-in overload and underload movement stops.
   10. Connection: 1/4-inch male NPT, bottom.
   11. Mounting: Stem Mount.
   12. Calibration:
      a. Adjustable pointer.
      b. Externally accessible zero adjustment.

D. Accessories:
   1. Pressure Snubber: Sintered stainless steel snubber threaded into gauge socket or in external stainless-steel housing with 1/4-inch NPT male and female connections.
   2. Process Isolation: Provide ball valves for process isolation in accordance with the requirements of Article 2.2, above.

E. Products and Manufacturers: Provide one of the following:
   1. Ashcroft, Duragage 1279 Series.
   2. Helicoid, Series 900.
   3. Wika EN 837.
   4. Or equal.

2.9 PRESSURE TRANSMITTER

A. Type: Solid State two-wire, differential capacitance or resonant wire type transmitter.

B. Function: Monitor system pressures as shown and as specified. The transmitter shall display the monitored pressure value and shall output a 4 to 20 mADC signal proportional to the monitored pressure.

C. Performance Requirements:
   1. Range: 0-60 PSI.
   2. Positive Overrange Protection: At least 1.25 times the maximum span limit.
   3. Accuracy (includes combined effects of linearity, hysteresis, and repeatability): ±0.10 percent of calibrated span.
   4. Repeatability: 0.05 percent of calibrated span.
   5. Hysteresis: 0.05 percent of calibrated span.
   6. Stability (drift over a six-month period): Not more than ±0.25 percent of transmitter's upper range limit.
   7. Power: Designated to operate on power from receiver or remote power supply, nominal 24 VDC.
   8. Supply Voltage Effect: Output change not greater than 0.005 percent of span for each one volt change in supply power.
   9. Output:
      a. Isolated direct acting 4 to 20 mADC.
      b. Digital process variable signal superimposed on 4 to 20 mADC signal without compromising loop integrity.
   10. Ambient Temperature Limits: -20 to +180 degrees F.
   11. Ambient Temperature Effect (Total Error per 100 degrees F change between the Ambient Temperature Limits): Not more than ±1.0 percent of the transmitter's upper range limit (maximum span).

D. Construction Features:
   1. Measuring elements protected by sealing diaphragm.
   2. Non-Wetted Parts:

a. Body and Process Connection Bolting: Type 316 stainless steel.
b. Housing and Cover: Die cast low copper aluminum alloy finished with epoxy paint system; covers shall be threaded and seated on Buna-N O-rings; NEMA 4 rating.
c. Capsule Fill Liquid: Use silicone except for process fluids containing chlorine. When the process fluid contains chlorine, the filling liquid shall be Halocarbon 63 or Flurolube 63.

3. Process Wetted Parts: To be compatible with the process fluid.
4. Calibration Adjustments:
   a. Zero: Adjustable in electronics compartment.
   b. Span: Coarse and fine adjustments in electronics compartment.
5. Zero Elevation and Suppression: The extent that the amount of suppression plus the calibrated span does not exceed the upper range limits of the sensor.
6. Damping: Internal Adjustable.
7. Built-in electrical surge and RFI protection.
8. Provide a single shutoff valve at each process line tap to enable live process removal of transmitter.
9. Provide Type 316 stainless steel three valve manifold for shutoff and pressure equalization on differential pressure and flow measurement applications.
10. Electrical Conduit Connection: 1/2-inch NPT.
11. Process Connection: 1/2-inch NPT.
12. Stainless steel mounting bracket and hardware suitable for mounting transmitter on flat vertical surface or a 2-inch diameter pipe.
13. Indicator: Provide integral indicator with range in engineering units.

E. Accessories:
1. Valves: Comply with requirements of Article 2.2, above.

F. Products and Manufacturers: Provide one of the following:
1. ABB, 600T Series.
2. Endress and Hauser, Cerabar S Model.
3. Rosemount, 3051 Series.
4. Or equal.

2.10 DIAPHRAGM SEAL

A. General:
1. Furnish diaphragm seals for pressure gauges and switches at locations shown and as specified.
2. The complete diaphragm seal assembly, including gage, switch or transmitter, shall be factory assembled, filled and calibrated to the ranges and switch setpoints specified prior to shipment.
3. System Supplier Manufacturer shall be responsible for assuring that fill volumes and sensitivities of the supplied seals and diaphragms are suitable to provide the required gage, switch or transmitter accuracy over the specified measurement range or at switch setpoints.

4. Location and orientation of the gauges, switches and seal assemblies shall be coordinated with the actual piping and equipment installations so that gages and indicators shall be easily read and accessed for maintenance by plant personnel.
5. Where field mounting and orientation conflicts arise due to incomplete coordination with field changes in the process piping and equipment installation, assemblies shall be relocated, re-oriented, re-assembled and re-calibrated as directed by the ENGINEER.

B. Construction Features:
1. Instrument Connection: 1/4-inch NPT.
2. Process Connection: 1/2-inch NPT.
3. Flushing Connection: 1/4-inch NPT.
4. Top Housing Materials: Type 316 stainless steel.
5. Process Side Housing Materials:
a. Type 316L stainless steel for metallic piping.
b. PVC or CPVC to match non-metallic piping.
6. Bolting Materials: Type 316 stainless steel.
7. Diaphragm, O-Rings, and Gasket Materials:

Process Fluid	**Diaphragm**	**O-Ring**	**Gasket**
Wastewater/Sludge	316 SS	Buna-N	Buna-S
Potassium	Carpenter 20	Viton	
Sodium Hypochlorite	Teflon	Teflon	Teflon
Polymer	316 SS	Buna-N	Buna-S
Phosphoric Acid	316 SS	Buna-N	Buna-S
Alum	316 SS	Teflon	Teflon
Chlorine Gas	Teflon	Teflon	Teflon
Chlorine Solution	Teflon	Teflon	Teflon
Sodium Chloride	Teflon	Teflon	Teflon
Ammonia	316 SS	Teflon	Teflon
Methanol	316 SS	Teflon	Teflon
Carbon	316 SS	Buna-N	Buna-N
Lime	316 SS	Teflon	Teflon
Ferric Chloride	Teflon	Teflon	Teflon
Caustic Soda	Teflon	Teflon	Teflon
Sodium Bisulfite	Teflon	Teflon	Teflon
Sodium Hydroxide	Teflon	Teflon	Teflon
Scrubber Solution	Teflon	Teflon	Teflon
Fluoride	Hastelloy C	Viton	
Phosphate	316 SS	Teflon	Teflon

8. Filling Liquid: Use silicone except for process fluids containing chlorine. When the process fluid contains chlorine, the filling liquid shall be Halocarbon 63 or Flurolube 63.

9. Working Pressure Rating: Equal to or greater than the attached gage or switch operating pressure specified in Exposed Piping Schedule in Section 40 05 05, Exposed Piping Installation, whichever is greater.

C. Accessories:
   1. Provide fill/bleed screw to permit filling of instrument and diaphragm seal.
   2. Provide a clean-out ring which holds the diaphragm captive in the upper housing to allow the upper housing assembly to be removed for recalibration or cleaning of the process side housing without the loss of filling liquid or change in calibration.

D. Products and Manufacturers: Provide one of the following:
   1. Helicoid, Type 100 HAC.
   2. Or equal.

2.11 GAS MONITORING SYSTEM

A. General: Gas monitoring system shall measure and display gas concentration at required sample locations and provide alarms when preset limits are exceeded. The gas monitoring system shall include the following:
   1. Gas Detection Receiver Panel: Panel construction shall conform to the requirements of this Section and shall be equipped with all required hardware including sensors, transmitters, sample pumps, and appurtenances.
   2. Gas Monitoring Transmitters: Quantity as required; Two minimum.
   3. Gas Monitoring Sensors: System shall provide gas senor quantity and type required to measure each of the following:
      a. Methane
      b. Hydrogen Sulfide
      c. Carbon Monoxide
      d. Oxygen
   4. Sample Pumps: Two. One sample pump will be dedicated to pumping the sample air for Methane Gas Detection. The second sample pump will be dedicated to sending the sample air for Hydrogen Sulfide, Carbon Monoxide, and Oxygen Gas Detection.
   5. Sample tubing: 1/4-inch 316 stainless steel as shown and specified shall be routed from each sample area to Gas Detection Receiver Panel.
   6. Water-stop filter: Installed at end of sample tubing in sampling area location to prevent water infiltration into sample line.

B. Required Features:
   1. Gas Monitoring System shall be suitable for outdoor installation.
   2. Combustible Gas Sensor:
      a. Type: Catalytic oxidation.
      b. Range: 0 to 100 percent lower explosive limit (LEL).
      c. Repeatability: ± One percent full scale.
      d. Temperature Range: -40 to 155 degrees F.
      e. Response Time: Less than 60 seconds to read 90 percent of step change.

f. Drift: ± One percent of full scale per week.
g. Sensor Life: Three years minimum.
h. Filter: Provide for protection from dust.
i. Sensor Guard: Required for moisture protection.
j. Enclosure: Explosion proof.

3. Hydrogen Sulfide Gas Sensor:
   a. Type: Electro-chemical semiconductor.
   b. Range: 0 to 50 ppm.
   c. Repeatability: ± One percent full scale.
   d. Temperature Range: -10 to 105 degrees F.
   e. Response Time: Less than 60 seconds to read 90 percent of step change.
   f. Drift: Less than two percent per month.
   g. Sensor Life: One year minimum.
   h. Filter: Provide for protection from dust.
   i. Sensor Guard: Required for moisture protection.
   j. Enclosure: Explosion proof.
4. Oxygen Sensor:
   a. Type: Electro-chemical galvanic cell.
   b. Range: 0 to 25 percent.
   c. Repeatability: ± One percent full scale.
   d. Temperature Range: 0 to 95 degrees F.
   e. Response Time: Less than 20 seconds to read 90 percent of step change.
   f. Drift: Less than five percent per month.
   g. Sensor Life: One year minimum.
   h. Filter: Provide for protection from dust.
   i. Sensor Guard: Required for moisture protection.
   j. Enclosure: Explosion proof.
5. Carbon Monoxide Sensor:
   a. Range: 0-500 PPM
   b. Accuracy: Linearity - +/- 2% full scale or 2ppm.
   c. Repeatability - +/-1% full scale.
   d. Response Time: Less than 30 seconds.
   e. Drift: Zero – Less than 5%/year.
   f. Sensor Life: One year minimum.
   g. Filter: Provide for protection from dust.
   h. Sensor Guard: Required for moisture protection.
   i. Material: 316 Stainless Steel.
   j. Enclosure: Explosion proof.
6. Environmental Requirements:
   a. Temperature Range: -40 º C to +40 º C (-40 ºF to + 140 º F).
   b. Humidity: 15-95 % Relative Humidity (non-condensing).
7. Sensor Electrical Rating: Class 1 Division 1 Groups A, B, C, D.
8. Installation Hardware: Provide Mounting Kit as required for installation of sensors, transmitters, and sample pumps inside Panel.
9. Mounting of sensor sample tubing location shall be in accordance with manufacturer recommendations.

10. Transmitter:
    a. Each transmitter shall be capable of accepting up to three sensors.
    b. Type: With integral display and capable of non-intrusive intrinsically safe calibration.
    c. Alarm Contacts: SPDT Relays, quantity as required. Configure for a Common Fault alarm between connected sensors, and an Alarm Condition for each gas sensor.
    d. Transmitter Power: 24 VDC, supplied over 3-wires current source.
    e. Transmitter Output: 4-20 mADC for each connected sensor.
    f. Transmitter Display: Organic LED; shall indicate power on, gas concentration, alarm, and fault conditions. Gas concentration shall alternate between the two sensor sources. Visible from a minimum of 5 feet and shall be present at all times.
11. Enclosure:
    a. Provide 316 Stainless Steel NEMA 4X panel, wall-mount type with locking handles. Enclosure shall be sized to accommodate all internally mounted hardware. Enclosure shall have viewing windows to permit viewing of internally mounted transmitter displays.
    b. Provide required hardware for proper venting of enclosure as shown and specified to prevent gas build-up should leak occur.
    c. Enclosure shall be suitable for outdoor installation. Provide panel mount heater. Enclosure shall be heated for freeze protection of internally mounted hardware. Provide heating/cooling calculations to substantiate heater size.
12. Accessories:
    a. Provide manufacturer recommended accessories.
    b. Tagging: Provide 316 SS engraved tag for sensor and transmitter required. Tags shall clearly indicate name of associated gas in addition to instrument tag and other required information for ease of identification.
    c. Provide panel nameplate in accordance with this Section.
    d. Provide 24 VDC Power Supply for transmitters and sample pumps.
    e. Provide terminal blocks, control relays, and appurtenances to accept all field wiring including remote signals from PLC panel and alarm relay panel, and 120VAC power feed.
    f. Provide 316 S.S. mounting hardware.
    g. Provide surge protection as required.
13. Calibration Equipment: The following equipment shall be supplied:
    a. Calibrator: The calibrator shall provide a quick and convenient method of checking response of Gas Monitoring System. The calibrator shall be a non-intrusive hand-held unit.
    b. Regulator, gauge, and carry case.
    c. Adaptor hose with sampling line connection.
    d. Calibration gas for each sensor. Submit details on expected shelf life for each type. Calibration gases shall not be purchased until required for delivery to maintain expected shelf life.

C. Products and Manufacturers: Provide one of the following:
   1. Series 5000, as manufactured by MSA.
   2. Model 2321, as manufactured by Gastech.
   3. Safe-Cal, as manufactured by Delphian Corp.
   4. Or equal.

2.12 REMOTE SIGNALING UNIT

A. General:
   1. Provide indoor and outdoor remote signaling unit of Go/No-Go status indication and alarming for use with Gas Monitoring and Ventilation Monitoring systems. Provide at locations shown on Drawings.
   2. Provide audible horn for units installed at indoor locations as shown. Outdoor units shall not include horn. Horn shall sound on activation of "No Go" alarm status.

B. Required Features:
   1. Warning Light:
      a. General: The light shall provide a visual warning in the area where a potential hazard may occur.
      b. Required Features:
         1. Steady-On LED.
         2. Stackable in any combination or color.
         3. For each, provide two stackable units:
            a) One Green lens color for "Go" status.
            b) One Amber lens color for "No-Go" alarm status.
         4. Vibration resistant heavy duty industrial design.
         5. Module rearrangement requires no wiring; screw terminals in base for field wiring.
         6. UL Listed.
         7. Mount vertically, with unit facing up.
         8. Provide wall mount bracket.
         9. Solid through bolt and copper bus interconnection.
         10. Power: 120 VAC.
         11. Enclosure: NEMA 7.
      c. Products and Manufacturers: Provide one of the following:
         1. Edwards, Adaptalight Stackable Beacon.
         2. Federal Signal.
         3. Or Equal.
   2. Safety Sign:
      a. General: Provide safety signs for mounting next to each warning light.
      b. Required Features:
         1) Material: Rigid laminated plastic.
         2) Sign Size: Minimum 7-inches wide by 12-inches high, 1/4-inch thick.
         3) Letter Size: Minimum 3-inches high.
         4) Color: Yellow background with black lettering.

5) Engraving for all warning light locations: 1st line: “DANGER”, 2nd line “GAS”.

c. Manufacturers: Provide products of one of the following:
1) Controls Unlimited, Perry, Ohio.
2) Or equal.

3. Horn:
a. General: The horn shall provide an audible warning in the area where a potential hazard may occur.
b. Required Features:
1) Decibel Output: 100 at ten feet, minimum.
2) Enclosure: Cast aluminum corrosion resistant housing.
3) Horn Diaphragm: Stainless steel.
4) Power: 120 VAC.
c. Products and Manufacturers: Provide one of the following:
1) Model 31X, as manufactured by Federal Signal.
2) Or equal.

4. A test switch shall be conveniently located as shown for the purpose of activating the audible and visual signals in order to validate their operation. The test switch shall be a momentary pushbutton switch, UL listed for use in Division 1, Class 1, Groups C&D areas, is corrosion resistant, suitable for wall mounting and is rated at 120 VAC, 60 Hz, three amperes. The test switch shall be an Allen-Bradley Company Bulletin 800H, heavy duty pushbuttons factory assembled station or equal.

2.13 ALARM RELAY PANEL

A. General:
1. Alarm relay panels shall be provided for ventilation and gas detection systems as shown and specified. Refer to Division 26 for details.

B. Required Features:
1. Provide all necessary relays, wiring, and appurtenances to accept alarm signals, indicate the alarm on the panel, and output needed signals to the associated remote signaling units shown and specified.
2. Provide wall mount NEMA 4X enclosure sized to accommodate all required devices.
3. Provide nameplate for each alarm relay panel engraved with panel name. Nameplate shall be in accordance with this Section. Panel names shall include “Dry Well Ventilation Alarm Relay Panel” and “Wet Well Gas Detection Alarm Relay Panel” as shown on Contract Drawings.

2.14 AUTOMATIC TELEPHONE DIALER

A. General:
1. The specified Automatic Telephone Dialer assembly has been custom designed specifically for OWNER’s use to permit integration with the OWNER’s existing Alarm Server at North Yonkers Pump Station. The

specified Automatic Telephone Dialer assembly can only be purchased through the OWNER's Authorized RACO Distributor. CONTRACTOR shall be required to purchase the Automatic Telephone Dialer assembly hardware from the OWNER's Authorized RACO Distributor. No exceptions shall be permitted.

2. Programming of the Automatic Telephone Dialer shall be in accordance with OWNER standards. CONTRACTOR shall retain services of an authorized manufacturer representative to provide on-site services for start-up and training of dialer, integration of dialer at OWNER's existing Alarm Server, and communications testing between station and OWNER's existing Alarm Server. CONTRACTOR shall be required to retain services of manufacturer representative from OWNER's Authorized RACO Distributor. No exceptions shall be permitted.
3. OWNER's Authorized RACO Distributor shall be the following:
   a. Miller Energy, Inc., 3200 So. Clinton Avenue, South Plainfield, NJ 07080
   b. Contact: James Pefanis, Email: jpefanis@millerenergy.com, Office: 908-755-6700, Mobile: 908-210-7573
4. Automatic Telephone Dialer signal input list shall be coordinated with OWNER and arranged in order required by OWNER. Any unused dialer inputs shall be prewired to spare terminal blocks in station's control panel for future use.

B. Features:
   1. NEMA 1 housing
   2. Housing dimensions: 11-7/8" H x 9-3/4" W x 5" D
   3. Power supply: 120 VAC, 60 Hz.
   4. Operating Temperature: 20°F to 130°F.
   5. Operating Humidity: 0 to 95 percent non-condensing.
   6. Signal inputs:
      a. 32 digital inputs.
      b. 4 analog inputs.
   7. Phone line input for standard "dial-up" telephone line connection through 4-pin modular jack (RJ11).

C. Products and Manufacturers: Provide:
   1. RACO, Verbatim Series Autodialer Assembly with the following factory installed components:
      a. Verbatim 32-channel Autodialer unit, Part No. 304VSS-32C.
      b. Verbatim SCADA card, Part No. 460VSCADA.
      c. Verbatim daughter card, Part No. 345VDCA-1.
      d. Verbatim 4-Analog Signal Input card (4-20mA), Part No. 360V4A-1E/4-20mA.
   2. No substitution permitted.

2.15 CHART RECORDER

A. General:
   1. Provide circular paper chart recorder for recording flow and pressure measurements.

B. Required Features:
   1. Power Supply: 120 VAC, 60 Hz.
   2. Digital display.
   3. Ambient Temperature Range: 32 to 122 degrees F.
   4. Scan Time - 250 msec.
   5. Unit Memory - 1 MB.
   6. Two 4-20 mA inputs.
   7. Two 4-20 mA retransmission outputs.
   8. Chart Type: Circular.
   9. Chart Speeds: 1 to 4,000 hours/revolution.

C. Provide chart recorder paper of quantity to suit one year of continuous operation.

D. Products and Manufacturers
   1. DR4300 by Honeywell
   2. C1900R by ABB.
   3. Or equal.

2.16 NETWORK CABINET, WALL MOUNT

A. General:
   1. Provide wall mount cabinet with 19-inch rack to house network hardware as shown and specified. Network cabinet shall be sized to house UPS, Owner provided Router, Internet Service Provider Modem(s), and appurtenances as shown and specified.

B. Required Features:
   1. Type: Wall mount cabinet with.
   2. Provide 19-inch rack rail inside cabinet for mounting of all equipment. Provide rack mounting screws.
   3. Front: Solid door, 16-gauge steel.
   4. Key locking wing knobs. Provide two keys.
   5. Top: Integral drip shield with thermostatically controlled fans.
   6. Bottom: Perforated, vented base for incoming air with internal serviceable filter.
   7. Filter: Expanded aluminum. In addition to installed filter, provide one spare replacement filter.
   7. Rated: UL Type 3R.
   8. Electrical: Provide built-in power distribution system and ground bus.
   9. Height: 12U or as required; sized to accommodate all required equipment.
   10. Environmental: Provide temperature-controlled fan.

11. Fans: Two 120VAC fans, providing 230 CFM airflow.
12. Thermostat: Inline thermostat shall automatically turn fans on when temperature exceeds 85 degrees Fahrenheit.

C. Accessories:
1. Rack Shelf: A rack shelf shall be provided for each piece of equipment that requires surface mounting in a rack enclosure. Rack shelf shall be vented allowing for added flow-thru ventilation, designed for 19" rack mount widths, and sized 1U. Rack shelf shall be 1-piece design and 16 AWG steel construction. Provide mounting hardware and appurtenances.
2. Provide nameplate for network cabinet as shown and specified.

D. Products and Manufacturers: Provide:
1. Protek Single-Hinged Cabinet with Fan Package by Hoffman Enclosures.

2.17 PANELS

A. General Provisions:
1. Provide electrical components and devices, support hardware, fasteners, and interconnecting wiring and piping required to provide control panels complete and operational.
2. Locate hardware so that connections can be easily made and there is ample room for servicing each item.
3. Adequately support and restrain all devices and components mounted on or within the panel to prevent any movement.
4. Provide panels with sub-panels for installation of all internally mounted hardware.
5. Provide numbered terminal strips for terminating field wiring and wiring from other panels, unless otherwise shown or indicated. All wiring to panel connections from field instruments, devices, and other panels shall be terminated at master numbered terminal strips, unless otherwise specified.
6. Provide copper grounding studs for hardware requiring grounding.
7. Provide the following convenience accessories inside each panel:
   a. One 120 vac, 20-amp duplex, grounding type receptacle.
   b. One or more LED type light fixture(s) with 40-watt equivalent lamp to span across the width of the panel but not less than two-thirds the width of the panel. Light fixture(s) shall have integral or external door switch that shall automatically turn on service light when panel door is opened and turn off light when door is closed.
   c. Service light with switch and duplex receptacle shall have a dedicated circuit breaker.
8. Control of Environment (Except NEMA 7 Panels):
   a. Provide 120 vac thermostatically controlled fan-driven heater units to maintain stable temperature within enclosure to protect equipment from harmful effects of condensation, corrosion, and low temperatures inside panels.
   b. Provide automatically controlled closed-loop heat exchangers or closed-

loop air conditioners to maintain temperature inside each enclosure at optimum operating temperature rating of components inside the enclosure.

c. Each heat exchanger or air conditioner shall have a dedicated, properly sized and rated circuit breaker.

d. Submit supporting calculations as part of panel Shop Drawing submittal if panel equipment to comply with specified environmental requirements is proposed to be deleted as unnecessary.

9. Panels to be located in non-hazardous (non-classified) environments shall comply with UL 50 and UL 508A.
10. Panels to be located in hazardous (classified) environments shall comply with UL 698A and UL 2062.
11. Provide panels under this Section with twenty percent additional space requirements for future use. Install nothing in space reserved for future use.
12. CONTRACTOR with I&C Subcontractor is responsible for detailed layout and design of panels, in accordance with standard practice and techniques and the Contract Documents. Base cutouts and design on instrument manufacturers' requirements. Panel layout shall be subject to approval by the ENGINEER.
13. Lower 12 inches of free-standing panels shall be free of devices, including Panduits and terminal strips, for ease of installation and maintenance.
14. No device shall be mounted less than 36-inches above the operating floor level, unless otherwise specified.
15. Wire bundles between subpanels and front panel-mounted devices shall be anchored and protected from damage by opening and closing of panel door.
16. Do not locate front panel-mounted devices requiring manipulation by operating personnel, such as pushbuttons, hand switches, controllers, and similar devices, higher than 5.5 feet above finished floor.
17. Panduits located on either side of terminal strips shall have minimum clearance of 1.5 inches between Panduit and terminal strip.
18. Provide three-inch high channel base assembly, drilled to mate panel to floor pad.
19. Provide easily accessible pocket built into panel door to enclose "as built" panel wiring diagrams.
20. Panels shall be UL-listed.

B. Identification:

1. Provide laminated plastic nameplate for identification of panels and components mounted thereon as follows:
   a. Nameplates shall be of 3/32-inch thick laminated phenolic type with white matte finish surface and black letter engraving.
   b. Panel identification nameplates to have 1/2-inch high letter engravings.
   c. Panel mounted component (e.g., control devices, indicating lights, selector switches, etc.) identification nameplates to have 1/4-inch high letter engravings.
   d. Nameplates shall be attached to the panel face with two stainless steel

self-tapping screws. When self-tapping screws may degrade panel's NEMA rating, retain NEMA rating intact by using gaskets on each side of panel surface and use retaining plate on the panel back that is same size as nameplate. When gaskets and retaining plate are used, use full-penetration screws with nuts.

e. Panels: Identify panel with nameplate engraved with panel name as shown and specified. Locate panel nameplate at the top, center of the panel on the front face. Nameplate engravings shall include the full name of the panel and the panel abbreviation. Panel abbreviation shall be enclosed in parentheses and on a separate line below the full panel name. Refer to the following example for line format:

Panel Identification Nameplate Line Format Example:

Weaver Street Pumping Station Control Panel (PS-WVR-CP)

2. Front Panel-Mounted Devices: Identify front panel-mounted devices with nameplates engraved with functional description of the device. Nameplate engravings shall include the instrument or equipment tag number and descriptive title as shown and specified.
3. Tag all internally mounted instruments in accordance with the following requirements:
   a. Tag numbers shall be as shown.
   b. The identifying tag number shall be permanently etched or embossed onto a stainless-steel tag which shall be fastened to the device housing with stainless steel rivets or self-tapping screws of appropriate size.
   c. Where neither of the above fastenings can be accomplished, tags shall be permanently attached to the device by a circlet of 1/16-inch diameter stainless steel wire rope.
   d. Identification tag shall be installed so that the numbers are easily visible to service personnel.
   e. Front of panel mounted instruments shall have the tag attached to rear of device.
4. Tagging of the following items shall be accomplished with the use of adhesive plastic Brady USA, Inc. or 3M labels.
   a. Tag all electrical devices (e.g., relays, timers, power supplies) mounted within control panels and enclosures.
   b. Tag all pneumatic lines.
   c. Numerically tag all terminal blocks.
   d. Color code and numerically tag wiring at each end.
5. Tag electric components and devices mounted within panels with high adhesive labels.
6. Identify terminal strips with nameplate engraved as "TB-XX" where "XX' is the numerical identification of terminal strip.
7. Identify terminals within each terminal strip with sequential numbers and wire numbers.

8. Internal panel wiring shall be color-coded and numerically identified with unique wire numbers affixed at each end of each wire. Color coding shall be in accordance with panel wiring color code table, below:

Panel Wiring Color Code Table

Description	Color
110 vac panel power before fuses or breakers	Black
Controlled 110 vac power (e.g., after relay contacts, selector switch contacts, and similar equipment.)	Red
110 vac power source from devices external to panel	Yellow
110 vac neutral	White
24 vdc positive power from power supplies	Brown
24 vdc negative power from power supplies	Supplier's Choice
Controlled 24 vdc power (e.g., after PLC output contacts, relay contacts, and similar)	Blue
24 vdc positive power from devices external to panel	Orange
24 vdc negative power from devices external to panel	Supplier's Choice
24 vdc four to 20 mA DC signal cable	Grey with red positive, clear negative
Grounding wire	Green

C. Panel Construction Features:
   1. NEMA 12 Panels: Panels located inside control or electric room areas shall be rated NEMA 12 with the following features:
      a. Fabricate enclosures using minimum 14-gage steel for wall- or frame-mounted enclosures and minimum 12-gage for free standing enclosures. Steel shall be free of pitting and surface blemishes.
      b. Continuously weld exterior seams and grind smooth. Surface grind panel to completely remove corrosion, burrs, sharp edges, and mill scale.
      c. Reinforce sheet steel with steel angles where required to adequately support devices and equipment and ensure rigidity and to preclude resonant vibrations.
      d. Panel shall be flat within tolerance of 1/16-inch over two-foot by two-foot area, or flat within tolerance of 1/8-inch for larger surface area. Acceptable out-of-flatness shall be gradual, in one direction only, and shall not consist of obvious depressions or a series of wavy sections.
      e. Use pan type construction for doors. Door widths shall not exceed three feet.
      f. Mount doors with full-length heavy-duty piano hinge with stainless steel hinge pins.
      g. Provide oil resistant gasket completely around each door or opening.
      h. Provide handle-operated, oil-tight, key-lockable three-point stainless steel latching system with rollers on latch-rods for easy door closing.
      i. Use stainless steel fasteners throughout.
      j. Provide interior mounting panels and shelves constructed of minimum 12-gage steel with white enamel finish.
      k. For prints, provide steel pocket with white enamel finish.
      l. Provide enclosure mounting supports as required for floor, frame, or

wall mounting as required.

m. Completely clean interior and exterior surfaces so surfaces are free of corrosive residue, oil, grease, and dirt. Zinc phosphatize for corrosion protection.
n. Provide one coat of primer paint to interior and exterior surfaces immediately after applying corrosion protection, in accordance with coating manufacturers' instructions. Provide surface preparation in accordance with coating manufacturer's requirements.
o. Paint interior surfaces with two coats of semi-gloss white polyurethane enamel.
p. Paint exterior surfaces with minimum of three finish coats of polyurethane enamel to produce a finish that is smooth and free of imperfections. Color shall be selected by ENGINEER from complete selection of standard and custom color charts furnished by manufacturer.
q. Primer and finish paint shall be compatible and shall be low-VOC, high-solids polyurethane enamel.

3. NEMA 4X, Stainless Steel Panels: Control panels located in non-environmentally controlled areas and outdoor areas shall be rated NEMA 4X and with the following features:
   a. Panels shall be Type 316L stainless steel construction with minimum thickness of 12-gage for all surfaces, except areas requiring reinforcing, with a smooth-brushed finish.
   b. Stainless steel screw clamp assemblies on three sides of each door.
   c. Rolled lip around three sides of door and along top of enclosure opening.
   d. Hasp and staple for padlocking.
   e. Provide clear-plastic, gasketed lockable hinged door to encompass non-NEMA 4X front-of-panel devices.
4. NEMA 7 Panels: Control Panels Located in Hazardous Rated Areas shall be rated NEMA 7:
   a. General: Provide explosion-proof enclosures, suitable for use in NEC Class 1, Groups C and D or Class II, Groups E, F and G applications and comply with UL 2062.
   b. Required Features:
      1) Lightweight and corrosion-resistant copper-free aluminum.
      2) Integral, cast-on mounting lugs.
      3) Left side door hinges.
      4) Viewing windows sized to suit internally mounted components.
      5) Stainless steel cover bolts.
      6) Cadmium-plated steel mounting pans.
      7) Enclosed heat-generating devices shall not cause external surfaces to reach temperatures capable of igniting explosive gas-air mixtures in surrounding atmosphere.
      8) Mark panels with appropriate class and group(s) for which panel is qualified. Panels shall comply with features and test criteria of NEMA 250.
5. Wall-Mounted Panels:
   a. General: Wall-mounted panels shall comply with applicable features and

standards specified in this Section for the associated NEMA-rated panel.

b. Unless otherwise indicated or approved by ENGINEER, depth of wall-mounted panels shall not exceed 18 inches.
c. Panels may be all stainless steel, fiberglass, polycarbonate, or acrylonitrile butadiene and styrene (ABS).
d. Provide appropriate size and number of external mounting feet.
e. Drilled holes or knockouts in back of wall-mounted panels are not allowed.
f. Provide corrosion-resistant polyester quick release latches (for non-stainless-steel panels) or stainless-steel screw clamp assemblies (for stainless steel panels).

D. Electrical Systems:
1. Power Source and Internal Power Distribution:
a. Provide in the panel, near where incoming power is terminated, nameplate with panel power supply source, type, voltage, and circuit number.
b. Protect incoming 120 vac power feeds to power the panel by providing lightning and surge arrestors, properly connected to grounds.
c. Provide panels with internal 120 vac power distribution system with properly sized and -rated circuit breakers to distribute power. Power not more than six devices from a single breaker. When power supplies are included in the panel, not more than two power supplies shall be powered from a single breaker. Convenience receptacles and interior panel lights shall have their own breakers. When one or more field instruments require 120 vac power from the panel for instrument power, power not more than three instruments from a given breaker.
d. Provide space for a minimum of two spare breakers in each panel.
2. Electrical Systems:
a. Internal wiring shall be Type MTW and THW stranded copper wire with thermoplastic insulation rated for 600 volts at 85 degrees C for single conductors, color-coded and labeled with wire identification.
b. For DC signal wiring, use shielded cable with 18-gage conductors. DC field signal wiring terminal strips shall be capable of handling wires up and including No. 12 size.
c. For AC power wiring, use No. 12 minimum AWG. For AC signal and control wiring, use No. 16 minimum AWG. For wiring carrying more than 15 amps, use sizes required by the NEC (NFPA 70) .
d. Inside of panels, route DC signal wiring separately from power wiring with minimum separation distance of six inches.
e. Use covered panduits to route internal panel cables and wiring. Panduits in each section of panel shall be appropriately sized to accommodate the quantity of wires to be routed with a spare capacity of 40 percent.
f. Install wire troughs inside panels along horizontal or vertical routes to present a neat appearance. Angled runs are unacceptable.
g. Wiring that is routed without panduits shall be adequately supported and restrained to prevent sagging or other movement. Use of adhesive

anchors to support or restrain wiring is unacceptable.

h. Provide panels with 600-volt rated barrier type terminal strips mounted on DIN rails. Identify terminal strips as indicated in this Section. Identification devices shall be self-stick, plastic tape strips with permanent, machine-printed numbers.
i. Wiring in panels shall be installed such that, if wires are removed from any one device, power will not be disrupted to other devices.
j. All alarms generated external to the panel, spare alarm, and repeat contacts shall be wired out to terminal blocks.
k. Provide fused type terminal blocks. For internal component-to-component wiring only, compression type terminal blocks are acceptable.
l. Provide spare terminals equal in number to 20 percent of terminals used for each type of wiring (e.g., dc signal and ac power).
m. Provide ground terminals to terminate the shield wire of shielded cables. Termination of more than two shielded wires on a single ground terminal is unacceptable.
n. Provide a single copper bus bar with 5/16-inch diameter copper grounding stud to connect the panel to external ground. Panel's internal grounds shall be terminated to the bus bar.
o. Where wires pass through panel walls, provide suitable bushings to prevent cutting or abrading of insulation.
p. When DC power or low voltage AC power is required, furnish and install in the panel required power supplies and transformers.
q. Provide circuit breakers to protect each circuit, with no more than six instruments on a single circuit.
r. Provide complete wiring diagram of "as-built" circuitry enclosed in transparent plastic.
s. Provide surge protection to protect electronics from surges propagating along the signal and power supply lines.

2.18 PROGRAMMABLE LOGIC CONTROLLER

A. General:
1. Provide programmable logic controller (PLC) system and all necessary components.
2. The PLC system shall be modular type with discrete and analog input/output (I/O) capabilities, as well as Ethernet communications. I/O shall be in 4, 8, or 16 arrangements.
3. Provide type and quantity of I/O as required to perform the operational and functional requirements, plus 20 percent spare for each type of I/O module used. Spare points shall be mounted and wired ready for use and shall require only field wiring connections and software configuration to place the point in service.
4. Power supplies shall be adequately sized to accommodate the PLC's entire I/O capacity, including spares.
5. Provide isolation transformers and other power normalization devices to

protect against over-voltage and frequency distortion characteristics where frequent power failures are common.

6. All PLC components including power supply, processor, communication modules, and I/O modules shall have conformal coating.

B. Required Features:

1. The unit shall use 4 to 20 mADC analog signals unless otherwise specified. Discrete signals shall use 24 VDC.
2. The PLC system shall perform the following functions:
   a. Accept analog input signals and contact input signals to meet interface requirements.
   b. Provide analog output signals and contact output signals as required to meet interface requirements.
   c. Communicate with devices over Ethernet TCP/IP communication protocol to perform the functions shown and specified. Provide communication modules/ports of type and quantity as required.
   d. Respond to interrogations for data and receive downloaded program changes and operating parameter changes.
   e. Errors and/or failures shall be indicated locally by Light Emitting Diode (LED). Multiple-bit errors shall cause immediate processor halt. Error diagnostic tables shall be user-accessible and provide clear and accurate descriptions of PLC system and process level errors.
3. The processor shall be capable of programming using ladder logic, function block, sequential function chart, and structured text.
4. The process controller, in conjunction with I/O modules, performs all system-level operations, system and data table monitoring and maintenance, alarm detection, PID control, user program executions, network request, and response handling.
5. The processor shall have the following features:
   a. User Memory: 2 MB minimum.
   b. Conformal Coating.
   c. A built-in USB port for programming, configuration, firmware update, and on-line edits.
6. The unit shall have a real-time clock to provide time reference for processor and system operations.
7. The unit shall have watchdog timers for monitoring system software operations to detect hardware malfunction or a nonproductive loop (stall condition).
8. The processor shall perform basic arithmetic operations using floating-point data.
9. The CPU shall function as a stand-alone unit which performs all functions described herein completely independent from the functioning of the Operator Interface Terminal (e.g., a failure of the Operator Interface Terminal shall not impact data acquisition, control, scaling, alarm checking, or communication functions of a given CPU).
10. Outputs shall have the capability of being "latched," so they are retentive through a power interruption.

11. Data Communications: The PLC shall be provided with an Ethernet module allowing the assignment of an IP address for remote network communications.

C. Communication Networks – Ethernet:
   1. Provide two separate and distinct communication networks for the Local Area Network (LAN) and the Wide Area Network (WAN).
      a. LAN shall be used for the local control panel network and shall not be connected to external communication networks. LAN shall include communication between PLC and local OIT.
      b. WAN shall be used for remote connection to OWNER'S SCADA Network.

D. Products and Manufacturers:
   1. PLC System shall be manufactured by Allen-Bradley (AB). Provide the following models, or latest AB model approved by OWNER:
      1. PLC Controller: AB Model 1769-L33ER
      2. Network card for WAN: AB Model 1769-AENTR
      3. Power Supply: AB Model 1769-PA4
      4. Discrete Input modules: AB Model 1769-IA16
      5. Discrete Output modules: AB Model 1769-OW16
      6. Analog Input modules: AB Model 1769-IF8
      7. Analog Output modules: AB Model 1769-OF8C
   2. No Substitution.

2.19 OPERATOR INTERFACE TERMINAL

A. General:
   1. Provide an Operator Interface Terminal (OIT) at each location as shown and specified for local process monitoring and control.
   2. OIT shall be compatible with the associated PLC.

B. Required Features:
   1. Type: LCD, color, touchscreen
   2. Size: 15-inch display or largest size available.
   3. Mounting: Front panel mounted with sealed display.
   4. Power Supply: 24VDC.
   5. Ports: Two RJ-45 Ethernet communication ports, USB port.
   6. Built-in memory card expansion slot.
   7. Internal battery backed clock or data timestamp.
   8. Provide all required software as specified by the manufacturer for operation of unit.

C. The units shall be designed for and capable of functioning in the following environmental conditions.
   1. Temperature:
      a. Operating: 0°C to 50°C (32°F to 122°F).

b. Non-operating: -20°C to 60°C (4°F to 140°F).
2. Humidity:
a. Operating: 20 to 80 percent RH, non-condensing.
b. Non-operating: 20 to 80 percent RH, non-condensing.

D. Manufacturer and Product: Provide the following:
1. Allen-Bradley, dual port PanelView Plus 7 model No. 2711P-T15C22D8S, or latest model approved by OWNER.
2. No Substitution.

2.20 POWER SUPPLIES

A. General: Single unit and multiple unit power supplies, located in field panels as required.

B. Multiple Unit Required Features:
1. Solid state circuitry.
2. Standard 19-inch RETMA (EIA) rail mounting.
3. Input Power: 120 VAC ±10 percent, 60 Hz.
4. Output Power: 24 VDC.
5. Polarity: Floating output.
6. Ambient Temperature: -10°C to +55°C.
7. Response Time: <20µS.
8. Include over voltage protection and output current limiting protection.
9. Connections:
a. Twist lock AC power connector.
b. DC power terminal strip.

C. Products and Manufacturers: Provide one of the following:
1. Weidmuller, CP-SNT-70W-24V-3A.
2. Or Equal.

2.21 UNINTERRUPTIBLE POWER SUPPLY

A. Uninterruptible Power Supply (UPS) system shall be furnished to provide a reliable source of uninterruptible power with no break in a-c output power during a complete or partial interruption of incoming line power. UPS shall include audio/visual alarms. UPS shall be UL listed.

B. UPS shall be comprised of a static inverter, a precision hysteresis loop battery charger, sealed maintenance free batteries, a relay, and shall be contained in a single compact package.

C. Under normal operating conditions, the critical load shall be powered by normal a-c line supply that has been filtered through a ferroresonant transformer. When a-c line power is present the inverter shall be normally off.

D. When a-c line power fails, the inverter shall supply a-c power to the transformer from the battery source. There shall be no break in the output of the system during transfer from normal a-c line supply to inverter battery supply or back to line. A single switch shall turn the system on and off. There shall also be an audible alarm disconnect switch.

E. Output capacity shall be provided to meet the load of the associated panel.
   1. Backup Run Time: Minimum 15 minutes full load.
   2. Input Voltage: 120 va-c.
   3. Output Voltage: 120 va-c.
   4. Voltage Regulation: ±3% nominal regulation.
   5. Efficiency: 85% on line at full load, 81% on inverter at full load.
   6. Wave Shape: Computer grade sine wave. Less than 5% THD.
   7. Frequency: 60 Hz ±0.5 Hz.
   8. Noise Rejection: Common mode better than 120dB. Transverse mode better than 60dB.
   9. Isolation: Complete isolation from line with less than 2 pf of effective capacitance.
   10. Operating Temperature: 32 F to +104 F.

F. Accessories:
   1. Communications Card: Each UPS shall be provided with a communication card for remote monitoring of status and alarm conditions. Card shall be of the same manufacturer as UPS and fully compatible with furnished UPS.
      a. Alarm Relay Card: UPS system located in a control panel shall be provided with an alarm relay card. Alarm relay card shall include dry contacts for the following signals: UPS On Battery status, UPS In Bypass Mode status, and UPS Low Battery alarm.
      b. Network Management Card: UPS systems located in a network cabinet shall be provided with a network management card. Network management card shall provide RJ45 port for remote status and alarm monitoring of UPS over Ethernet TCP/IP communication protocol. Provide environmental monitoring option.
   2. UPS Bypass Switch: Each UPS system shall be provided with an external bypass switch which permits UPS to be taken out of service for maintenance purposes without interruption of power supply to end devices by manual transfer to line power. UPS Bypass Switch mounting shall be suitable for required installation location and permit panel mount and rack mount options as required. UPS Bypass Switch shall be fully compatible with furnished UPS.

G. Product Manufacturer: Provide the following:
   1. American Power Conversion (APC) Corp., Smart-UPS 750.

2.22 PUSHBUTTONS, SELECTOR SWITCHES AND INDICATING LIGHTS

A. General:
   1. Pushbuttons, selector switches and indicating lights shall be supplied by one manufacturer and be of the same series or model type.
   2. Contacts: Double break, silver contacts with movable contact blade providing scrubbing action; Number and arrangement as required to perform intended functions specified, plus a minimum of one spare single pole, double throw contact per relay function.
   3. Type: Heavy duty, oil tight.
   4. Provide legend plate for indication of pushbutton, switch or light function as shown.
   5. Mounting: Flush mounted on control panel front.
   6. NEMA rated to match panel in which mounted.

B. Pushbuttons (Standard):
   1. Type: Provide unlighted, single pushbuttons as required to perform intended functions specified and shown.
   2. Contacts: Comply with the requirements specified for selector switches.

C. Indicating Lights:
   1. Type: Indicating Lights, Compact, Integral Transformer Type.
   2. Lamps: LED; 6 Volts, Long Life (20,000 hours minimum)
   3. Common push to test circuitry shall be provided for each panel to simultaneously test all indicating lights on the panel using a single pushbutton.

D. Button and Lens Colors:
   1. Green for Open; On; Running
   2. Red for Closed; Off; Stopped
   3. Amber for indication of equipment malfunction, process trouble and alarms (e.g., "HIGH LEVEL", "LOW LEVEL", etc.).
   4. Blue for Electrical Control Power On.

E. Selector Switches
   1. Provide number of positions/poles as required to perform functions shown and specified.
   2. Rating: AC or DC compatible - 10A resistive at 120 VAC or DC continuous minimum.
   3. Operator: Standard black knob.

F. Products and Manufacturers: Provide one of the following:
   1. Cutler-Hammer.
   2. Allen Bradley.
   3. Or equal.

2.22 CONTROL RELAY

A. Type: General purpose, plug-in type rated for continuous duty.

B. Construction Features:
   1. Coil Voltages: 24 VDC or 120 VAC, as required.
   2. Contacts:
      a. Silver cadmium oxide rated not less than 5 A resistive at 120 VAC or 24 VDC continuous.
      b. For switching low energy circuits (less than 200 mA) fine silver, gold flashed contacts rated not less than 3 A resistive at 120 VAC or 28 VDC continuous shall be provided.
   3. Relays to have clear plastic dust cover.
   4. Relays to have pilot light to show energized coil.
   5. Relays to be UL recognized.

C. Products and Manufacturers: Provide one of the following:
   1. Square D Company, Type R and/or Type K.
   2. IDEC, RU Series.
   3. Or equal.

2.23 DIGITAL INDICATOR

A. General: The digital indicator shall accept an analog input and convert it to scaled numerical characters for digital display and also provide up to two alarm outputs.

B. Required Features:
   1. Display Height: 0.56-inch.
   2. Display Capacity: Four digits with decimal point position jumper selectable.
   3. Display Type: Seven segment, red LED.
   4. Accuracy: ± 0.05 percent.
   5. Analog Input: 4 to 20 mADC.
   6. Excitation Output: 15 VDC for powering transmitter.
   7. Analog Output: Proportional 4 to 20 mADC.
   8. Alarm Output: Dual with two 2 A relays.
   9. Temperature Range: 0°C to 60°C.
   10. Power: 120 VAC, + 10 to -15 percent, five watts.
   11. Enclosure: NEMA 4X.
   12. UL Listed.

C. Products and Manufacturers: Provide one of the following:
   1. Precision Digital.
   2. Or equal.

2.24 CURRENT ISOLATOR (I/I SIGNAL REPEATER)

A. General: The isolating unit shall be a two wire, loop-powered device. It shall accept one 4 to 20 mADC input signal and deliver two 4 to 20 mADC output signals.

B. Required Features:
   1. Inputs: One 4 to 20 mADC signal.
   2. Output: Two 4 to 20 mADC signals.
   3. Repeatability: ±One percent of span.
   4. Ambient Temperature Range: 0°C to 50°C.
   5. Ambient Humidity Range: 0 to 95 percent, non-condensing.
   6. Accuracy: 0.5 percent.
   7. Linearity: ±0.1 percent of full scale.

C. Products and Manufacturers: Provide one of the following:
   1. Phoenix Contact, MINI MCR series.
   2. Or equal.

2.25 INTRINSIC SAFETY RELAY

A. General:
   1. The unit shall receive a signal from a hazardous area and repeat the signal in the non-hazardous area.
   2. Provide quantity as required.

B. Features
   1. Rated for Class 1, Division 1 and 2 areas.
   2. One channel.
   3. 120VAC.
   4. Ambient Temperature Range - 0 to 50 degrees C.
   5. Power indication light.
   6. DIN-rail mountable.
   7. For Analog Data Transmitters
      a. Unit shall accept a 4-20mADC input signal and deliver a 4-20mADC output.
      b. Linearity - +0.1 percent of full scale.
   8. For Isolation Switch Relays
      a. Unit shall accept one input and shall have one SPST output for control circuit and one SPST output for alarm condition monitoring.
      b. Hysteresis - 0.2 mA

C. Manufacturer and Product: Provide one of the following:
   1. Turck, Inc.
   2. Or equal.

2.25 TIME DELAY RELAY

A. General: Provide time delay relay as required.

B. Type: Dial adjustable, plug-in type time delay relay providing delay-on-make, delay-on-break or interval operation.

C. Construction Features:
   1. MOS digital circuit with transformer coupled power.
   2. Switch selectable ranges as follows:
      a. One second.
      b. Ten seconds.
      c. One minute.
      d. Ten minutes.
      e. One hour.
      f. Ten hours.
   3. Minimum Setting: Three percent of range, except 50 ms for one-second range.
   4. Setting Knob Accuracy: Ten percent.
   5. Contacts:
      a. Type: DPDT.
      b. Rating: 5 A resistive at 120 VAC, 5 A at 24 VDC.
   6. Housing: Plug-in design with dust and moisture resistant molded plastic case.
   7. Power Input: 120 VAC or 24 VDC as required.
   8. Operating Temperature: 0°C to 55°C.
   9. Unit shall have LED to show timing status.
   10. Relays to be UL recognized.

D. Products and Manufacturers: Provide one of the following:
   1. Automatic Timing and Controls Company, Series 328D.
   2. IDEC, Series GE1A.
   3. Or equal.

2.24 DOOR CONTACT (PANEL TAMPER SWITCH)

A. General:
   1. Panels shall be equipped with a tamper switch on each door to detect panel intrusion.

B. Features:
   1. Shall be of pushbutton type, single pole, double throw
   2. Shall be rated 10A at 125VAC.
   3. Construction materials:
      a. Case: thermoplastic polyester
      b. Actuating button: thermoplastic Acetal

c. Terminals: brass
d. Moving blade: beryllium copper
e. Spring: stainless steel
f. Contacts: silver alloy

4. Actuator: dual function switch, push in to operate in normal momentary mode and pull out for maintained action.
5. UL listed.

C. Products and Manufacturers: Provide one of the following:
1. Cherry, Inc., Model E/F69-30A.
2. Honeywell, Model 2AC59.
3. Or equal.

2.25 DOOR CONTACT (OVERHEAD/HATCH)

A. General:
1. Independently installed door contacts shall be provided on exterior hatches as shown and specified. Door contacts shall send a signal to the PLC for monitoring purposes of door open status.

B. Features:
1. The contact shall contain a hermetically sealed magnetic reed switch. The reed shall be potted in a high strength extruded aluminum contact housing. The magnet shall be made of Alnico V. Rare Earth Magnet shall be made of neodymium iron boron.
2. Explosion proof, UL listed for hazardous areas.
3. Pry-tamper plate.
4. Switch: SPDT.

C. Products and Manufacturers: Provide one of the following:
1. 2800 series, by Edwards Signaling
2. Or equal.

2.26 INPUT/OUTPUT POINT LIST

A. General:
1. The Input/Output (I/O) point list contains information required to configure PLC I/O interface hardware, and to indicate range conversion or signal functions.
2. I/O List is provided after PART 3 of this Section.

B. The headings for the I/O Point List are defined as follows:
1. “NO.” is a numeric character used to number list entries.
2. “POINT NUMBER” is an alphanumeric character string. Each tag shall be written as “NN - IY - #### A”, where:
a. NN = Area/Location Identifier.
b. I = ISA Identification.

c. Y = Function Identifier.
d. #### = 4 Digit Loop Number.
e. A = Suffix (to distinguish between similar variables).

3. "DESCRIPTION" is an alphanumeric character string up to 40 characters in length. Points described as "SPARE" indicate pre-wired I/O.
4. "SIGNAL TYPE" is one of the following:
   a. AI indicates analog input.
   b. DI indicates discrete input.
   d. AO indicates analog output.
   e. DO indicates momentary, maintained or latched discrete output.
   f. PI indicates pulse input.
   g. ETH designates a signal sent via Ethernet communication link.
   h. FB indicates foundation field bus.
   i. PB indicates profi bus.
   j. MB indicates Modbus.
   k. DN indicates device net.
5. "I/O TYPE" indicates one of the following:
   a. HARDW designates a hardwired signal.
   b. COMM designates a signal sent over digital communication from another panel or device.
6. "I/O LOCATION" identifies the control panel the I/O is located.
7. "TERMINATION LOCATION" indicates the new location where the associated I/O is to be terminated at the PLC. This information shall be provided by I&C Subcontractor and coordinated with ENGINEER.
8. "INPUT FROM/OUTPUT TO" is an alphanumeric character string that describes the device or panel from where I/O Point originates or ends.
9. "DRAWING REFERENCE" is an alphanumeric character string used to reference the drawing.

C. Area/Location Identifier:
   1. PS-WVR = Weaver Street Pump Station

D. ISA Identification
   1. A = Analytical.
   2. B = Burner, Combustion.
   3. C = Cooling (Cooling Condenser).
   4. D = Dissolved.
   5. E = Voltage.
   6. F = Flow.
   7. G = Intrusion.
   8. H = Hand.
   9. I = Current.
   10. J = Power.
   11. K = Time.
   12. L = Level.
   13. M = Manual.
   14. N = UNDEFINED.

15. O = Overload.
16. P = Pressure.
17. Q = Communication.
18. R = Reverse.
19. S = Speed, Frequency.
20. T = Temperature.
21. U = Universal (Common).
22. V = Vibration.
23. W = Torque (Weight or Force).
24. X = Critical (Emergency).
25. Y = Event, State or Presence.
26. Z = Position, Dimension.

E. Function Identifier:
1. A = Alarm
2. B = UNDEFINED.
3. C = Control.
4. D = Differential.
5. E = Element.
6. F = Failure.
7. G = UNDEFINED.
8. H = High.
9. I = Indication.
10. J = UNDEFINED.
11. K = Factor.
12. L = Low.
13. M = Mode.
14. N = Normal.
15. O = Oxygen.
16. P = UNDEFINED.
17. Q = Quantity.
18. R = Rotation.
19. S = Switch.
20. T = Timer
21. U = UNDEFINED.
22. V = Slow (output)
23. W = Slow (input)
24. X = Selector Switch (input)

2.27 SPARE PARTS AND TEST EQUIPMENT

A. Furnish the spare parts and test equipment in accordance with the Contract Documents, identical to and interchangeable with similar materials and equipment provided under this Section.

B. Provide source quality control for spare parts as part of factory testing prior to shipment of process control system equipment.

C. Furnish the following spare parts and test equipment:
   1. PLC and OIT hardware as follows:
      a. One PLC power supply of type furnished for this Contract.
      b. One of each type of PLC input/output module or card furnished for this Contract.
      c. One OIT of type furnished for this Contract.
   2. UPS hardware as follows:
      a. One dry contact card of type furnished under this Contract.
      b. One network management card of type furnished under this Contract.
   3. One-year supply of all expendable or consumable materials. Expendable materials include, but are not limited to, the following:
      a. Calibration standards.
      b. Replacement filters.
      c. Replacement batteries.
      d. Replacement electrodes.
   4. One per quantity of five or fraction thereof of gauges, indicators, and switches provided, complete with diaphragm seals, filled and ready to use.
   5. One per quantity of ten of fraction thereof provided, per range of field instruments including insertion type instruments. No spares are required for inline instruments such as magnetic flow meters and flumes or venturis that include flow tubes through which flow is conveyed.
   6. Fuses: Twelve of each type and size of fuse used in instruments and panels.
   7. Relays: Five of each type for each quantity of forty or fraction thereof provided under the Contract.
   8. One per ten (two, if fewer than twenty) of each type of panel mounted instrument or device including lights, pushbuttons, switches, and digital displays.
   9. Gas Monitoring System components as follows:
      a. One gas sensor of each type furnished under this Contract.
      b. One transmitter of each type furnished under this Contract.
      c One sample pump of each type furnished under this Contract.
      d. One year's supply of calibration gas for each sensor. Assume each sensor is calibrated once per month. Submit calculations which determine number of calibration gas bottles to be supplied and identify expected shelf life for each. Calibration gases shall not be purchased until required for delivery to maintain expected shelf life.

2.28 SOURCE QUALITY CONTROL – FACTORY ACCEPTANCE TESTING

A. General:
   1. Representatives of OWNER and ENGINEER will witness factory acceptance test (FAT) at control panel testing facility, either for individual units or as an integrated system. Presence of OWNER and ENGINEER during testing does not relieve CONTRACTOR from complying with the Contract Documents and shall not imply acceptance of equipment.
   2. CONTRACTOR shall coordinate scheduling of witnessed FAT with

OWNER and ENGINEER so that arrangements for test witnessing can be made. CONTRACTOR shall submit proposed testing dates with testing location details a minimum of 30-days prior to the proposed testing date for review and approval.

3. Expenses and costs for one representative from OWNER and one representative from ENGINEER to attend the witnessed FAT shall be paid by the CONTRACTOR.
    a. Expenses and costs shall include the following:
        1) Transportation of personnel to the factory test location and return via commercial airline, and ground transportation to and from airports as required.
        2) Overnight accommodations (two single occupancy rooms) in a hotel in reasonable proximity to the factory testing location. Room quality to be standard business class.
        3) Ground transportation between the hotel and factory testing location.
        4) Meals for the duration of the testing. Meal allowance shall not be less than U.S. Internal Revenue Service guidelines.
    b. Should a FAT run fail to comply with the Contract Documents, necessary changes and corrections shall be made and the entire system retested until acceptable results are achieved. Expenses and costs for OWNER and ENGINEER witnessing such retesting shall be paid by CONTRACTOR.
4. Submit witnessed FAT test plan procedure for review and approval at least four weeks prior to test. Approval of test plan shall be required prior to start of FAT.
5. Factory test results will be acceptable when all components within tested control panel or system being tested successfully operate and meet its intended function and are so certified by the testing entity. If the test fails as determined by the OWNER and ENGINEER's representatives, deficiencies will be corrected, and an additional FAT shall be conducted within two weeks at no cost additional to the OWNER. All expenses for the second FAT shall be borne by the CONTRACTOR.
6. When factory tests have been successfully completed, submit factory test report to ENGINEER.
7. Do not ship the equipment until obtaining ENGINEER's acceptance of factory test results.
8. Shipment of a control panel without successful FAT, as determined by the ENGINEER and/or OWNER, shall be the cause to withhold payment of the complete cost of the panel until the panel is fully functional in the field for a duration of four months.

B. The following documentation shall be made available to the OWNER and ENGINEER at the test site both before and during factory testing:
    1. All Contract Drawings and Specifications, addenda, and change orders.
    2. Master copy of the test procedure.
    3. Bill of material of the equipment and software to be tested including make,

model, and serial number. Include spare parts to be tested under this Section.
4. Design-related hardware submittal applicable to the equipment being tested.

C. The daily schedule during these tests shall be as follows:
1. Morning meeting to review the day's test schedule.
2. Scheduled tests and sign-offs.
3. End of day meeting to review the day's test results and to review or revise the next day's test schedule.
4. Unstructured testing period by the witnesses.

D. During the factory test, for a period of time equal to at least 20 percent of the test duration, the ENGINEER and OWNER shall have unrestricted access to the system to perform any additional testing desired or to re-test any previously tested components.

E. Tests to be performed for the witnessed FAT shall include:
1. Panel Inspection.
2. System Inspection.
3. System Hardware Operational Testing.
4. System Software Demonstration. Completion of panel inspection, system inspection, and system hardware operational testing shall be required prior to start of system software demonstration.

F. Panel Inspection:
1. Inspect each panel, console, device, and cabinet before testing and before shipping. Inspection shall include, but not be limited to the following verifications:
a. All "Approved as Corrected" comments on Shop Drawings were implemented.
b. Presence of and accuracy of nameplates and tags.
c. Wire sizes and color-coding comply with the Contract Documents.
d. Presence of terminal blocks, terminal block numbers, and required quantity of spares.
e. Proper wiring practices and grounding.
f. Enclosure flatness, finish, and color.
g. Anchoring of wire bundles between subpanels and front panel-mounted devices.
h. Presence of applicable items specified in this Section.
2. Correct materials and equipment that do not comply with the Contract Documents and submittals approved by ENGINEER, and re-inspect until compliance is verified.

G. System Inspection:
1. Perform a system audit to verify all components have been staged for the test.
2. Inspect the system inventory to verify all components have been documented properly with correct model numbers, serial numbers, etc.

H. System Hardware Operational Testing:
   1. Separately test each panel furnished under this Contract to verify that panel instruments and processors perform and function properly in accordance with the Contract Documents. For the factory test required in this Section, simulate field sensors and field instruments using appropriate signal generators, switches, and jumper cables.
   2. Perform an integrated system test, with all control system equipment connected (excluding field sensors and instruments), to verify that equipment performs and functions properly as an integrated system. During the factory test, simulate field sensors and instruments using appropriate signal generators, switches, and jumper cables.
   3. Tests to be performed during the system hardware operational testing shall include, but not be limited to, the following:
      a. I/O Point Checkout: An I/O point checkout of each I/O type shall be performed to verify proper operation of the input/output points. The verification of the signals shall be accomplished via the use of the PLC programming software. At a minimum, the I/O checkout shall consist of the following four steps:
         1) Digital input signals shall be jumpered within the termination connections of the PLC panels and verification of proper alarming, statuses, etc., shall be performed utilizing the tools available in the PLC programming software.
         2) Analog input signals shall be connected to a signal generator at the termination connections and signals shall be verified at zero percent, 25 percent, 50 percent, 75 percent, and 100 percent of full scale. The appropriate scaled value shall be verified utilizing the tools available in the PLC programming software. Additionally, out of range testing (over and under scale) shall be accomplished.
         3) Digital output signals shall be initiated by the user by writing to the signals utilizing the PLC programming software. Verification shall occur in the PLC panel by connecting a digital multimeter to measure the continuity at the terminations, thus verifying the command from the PLC has properly executed the contact closure.
         4) Analog output signals shall be initiated by the user by writing to the signals utilizing the PLC programming software. Verification shall occur in the PLC panel by utilizing a digital multimeter to measure the current/voltage generated at the termination points.
      b. Equipment Operability Check:
         1) Test each input/output device and component to verify operability. If panel or device being tested contains pneumatic systems, test the instruments associated with such systems to verify that calibration.
      c. Stand-alone Unit Check: Test all system hardware components to

verify proper operation of the equipment as stand-alone units and as a system. Tests shall include, but are not necessarily limited to, the following:

1) AC/DC power checks.
2) Power fail/restart tests.
3) Verify that network switch and fiber-optic converters are powered by separate circuits, as applicable.
4) Verify that quantity of circuits assigned to power field instruments corresponds to approved Shop Drawings and approved other CONTRACTOR submittals.
5) Demonstrate the ability of UPS systems to meet the runtime requirements upon loss of power, as applicable.
6) Demonstrate failover capabilities of the redundant PLCs, as applicable.
7) Demonstrate communication failure and system restart.

I. All deficiencies identified during the panel inspection, system inspection, and system hardware operational tests shall be corrected and re-tested prior to starting the System Software Demonstration.

J. System Software Demonstration (Programming by ENGINEER):
   1. General:
      a. CONTRACTOR shall coordinate scheduling and required duration of the System Software Demonstration with the ENGINEER's Programmer.
      b. The System Software Demonstration shall be run by the ENGINEER's Programmer and be conducted at the I&C Subcontractor's panel shop facility. I&C Subcontractor shall be responsible to prepare site for system software demonstration including all hardware, materials, and equipment required for testing.
      c. ENGINEER's Programmer will provide the procedure for functional checks to be performed during the system software demonstration. ENGINEER's Programmer will supply the PLC and OIT software programs and upload prior to start of demonstration. CONTRACTOR shall allot 4-hours' time for ENGINEER's Programmer to load program and complete preliminary checks prior to start of system software demonstration.
   2. Preparation:
      a. System performance shall be tested using fully-integrated system, including all software and hardware. Entire control system shall be assembled at the factory test location and simulated inputs applied. Signal generators shall be appropriately sized and calibrated for full range of use and shall have a power source to accommodate not less than a full day of testing. Provide process I/O simulation panel that includes the following:
         1) Toggle switches to simulate field or other input contacts.
         2) Indicating lights to simulate outputs from tested panels.

3) Control relays to simulate motor control center coil inputs.
4) Time relays to simulate position switches.
5) Indications (in milliamps) to indicate every 4 to 20 ma-dc output from tested panel.
6) Potentiometers to simulate 4 to 20 ma-dc inputs to tested panel.
7) Each device shall have nameplate with description and device's process and instrumentation Drawings (P&ID) tag number. Nameplates shall be removable and interchangeable for multiple use of the panel during the test.

3. System software demonstration performed by the ENGINEER's Programmer will include, but not be limited to, the following:
   a. Demonstration of system software utility programs and system software security programs incorporated into the control system for proper functioning.
   b. Demonstration of monitoring and control information associated with I/O points configured for display on operator graphic screens performs and functions as intended.
   c. Demonstration of application software associated with process control strategies performs and functions as intended.
   d. Demonstration of logical failure conditions for programmed control strategies (i.e., instrument failures, equipment failures, loss of communication between the Process I/O Server and the PLC, loss of peer-to-peer communication, etc.).
4. CONTRACTOR shall include documentation from completed functional checks in test report for record purposes.

K. The system must operate continuously throughout testing without failure, except where initiated per the established test procedures. Any unanticipated failures may, at the OWNER and/or ENGINEER's option, result in the overall witnessed FAT being deemed unsuccessful. Witnessed FAT failure criteria shall include one or more of the following:
1. Nonconformance to the items specified for witnessed FAT.
2. Failure or nonfunctioning of any hardware.
3. Failure or nonfunctioning of any communication link.
4. Failure of more than 10 internal panel wiring discrepancies per panel including I/O point cross wirings.
5. More than 10 I/O point assignment errors against approved panel shop drawings per panel.

L. Successful completion of the witnessed FAT, as determined by the OWNER and/or ENGINEER, shall be the basis for approval of the system to be shipped to the jobsite.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine conditions under which the Work will be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Environmental Requirements:
   1. Do not install instruments in areas where construction may cause instrument to be damaged, without providing adequate protection for said instrument.

B. Installation of Instrumentation:
   1. Secure field-mounted instruments to stands or brackets in accordance with manufacturer's recommendations, approved or accepted (as applicable) submittals, and the Contract Documents.
   2. Locate sensors where shown on the Drawings. Confirm exact locations in the field with ENGINEER.
   3. Install all devices so that devices are readily accessible for service and do not cause potential hazards.

C. Services and Operator Instructions:
   1. Provide repairs or replacement of defective materials, equipment or workmanship, including with respect to equipment, the services of factory-trained servicemen.
   2. In addition to the calibration required for check-out, provide two additional calibrations on all instruments. The first re-calibration shall be approximately six months after acceptance of the system, and the second shall be approximately eleven months after acceptance. As part of each calibration, provide two copies of the calibration sheets, a detailed list of deficiencies (should any be found), and a statement that the entire system is in proper operation and condition (except for the deficiencies noted) and shall be turned over to the OWNER.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections: Field-verify calibration and performance of each instrument prior to start-up of the associated equipment, and document on a separate sheet for each.
   1. For each calibration certification sheet, include the following information:
      a. Project name.
      b. Tag number and description.
      c. Manufacturer.
      d. Model and serial number.
      e. Date, time and person who performed calibration.
      f. Calibration data to include.

1) Input, output, and error at 0, 25, 75, and 100 percent of span for analog instruments.
2) Switch setting, contact action and deadband, if applicable, for discrete elements.

g. Space for comments.
h. Signature and date.

2. System Check-Out and Start-Up Responsibilities:
   a. CONTRACTOR shall retain the services of the System Supplier to supervise and/or perform check-out and start-up of all system components. As part of these services, the System Supplier shall include for those equipment items not manufactured by him the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.
   b. Check and approve the installation of all instrumentation and control system components and all cable and wiring connections between the various system components prior to placing the various processes and equipment into operation.
   c. Conduct a complete system checkout and adjustment, including calibration of all instruments, tuning of control loops, checking operation functions, and testing of final control actions. When there are future operational functions included in the Work, they should be included in the system checkout. All problems encountered shall be promptly corrected to prevent any delays in start-up of the various unit processes.
   d. CONTRACTOR shall provide all test equipment necessary to perform the testing during system checkout and start-up.
   e. CONTRACTOR and System Supplier shall be responsible for initial operation of monitoring and control system and shall make any required changes, adjustments, or replacements for operation, monitoring and control of the various processes and equipment necessary to perform the functions intended at no additional cost to the OWNER. These changes or adjustments shall be documented by the CONTRACTOR and submitted to the ENGINEER as part of the Installation Inspection Report described in Paragraph g. below.
   f. CONTRACTOR shall furnish to the ENGINEER certified calibration reports for field instruments and panel mounted devices specified in this Section as soon as calibration is completed.
   g. CONTRACTOR shall furnish ENGINEER an Installation Inspection Report certifying that all equipment has been installed correctly and is operating properly. The report shall be signed by authorized representatives of both CONTRACTOR and the System Supplier.
   h. Integrated System Field Test:
      1) Following the instrumentation and control system checkout and initial operation, CONTRACTOR, under the supervision of the System Supplier, shall perform a complete system test to verify

that all equipment and programmed software is operating properly as a fully integrated system, and that the intended instrumentation and control functions are fully implemented and operational. Any defects or problems found during the test shall be corrected by CONTRACTOR and then retested to demonstrate proper operation.

2) Following demonstration of all system functions, the instrumentation and control system, including field sensors/transducers and instruments, and telemetry system shall be running and fully operational for a continuous 48-hour period.

B. Operational Availability Demonstration:

1. Operational Availability Demonstration (OAD) shall begin following completion of the integrated system field test as specified above and shall continue until a time frame has been achieved wherein the system (both hardware and software) availability meets or exceeds 99.7 percent for 30 consecutive days and no system failures have occurred which result in starting the OAD over again. During the OAD the system shall be available to OWNER personnel for use in normal operation.
2. For purposes of the OAD, the system will be defined as consisting of the following systems and components:
   a. Instruments.
   b. Panels and panel-mounted instruments, including all PLC and OIT hardware.
   c. Digital communication links.
   d. Power supplies and UPS.
   e. Surge devices.
3. The conditions listed below shall constitute system failures which are considered critical to the operability and maintainability of the system. The OAD shall be terminated if one or more of these conditions occur. Following correction of the problem, a new 30 consecutive day OAD shall begin.
   a. Failure to repair a hardware or software problem within 120 consecutive hours from the time of notification of a system failure.
   b. Recurrent hardware or software problems: if the same type of problem occurs three times or more.
   c. Software problem causing a processor to halt execution.
4. The following conditions shall constitute a system failure in determining the system availability based on the equation specified below:
   a. Failure of major equipment listed above.
   b. Loss of communications between devices on the communications network.
   c. Failure of one or more input/output components.
   d. Failures of any type affecting ten or more input/output points simultaneously.
   e. Failure of any type affecting one or more regulatory control loops or sequential control strategies thereby causing a loss of the automatic

control of the process variable or process sequence operation.

f. Failure of power supply. Where redundant power supplies are provided, failure of one power supply shall not constitute a system failure provided the backup power supply operates properly and maintains supply power. Failure of the backup supply to operate properly and maintain supply power shall constitute a system failure.

g. Failure of three or more primary sensors/transducers or field instruments simultaneously.

5. The system availability shall be calculated based on the following equation:

$$A = \frac{TTO}{TTO + TTR} \times 100 \text{ percent}$$

where,

A = system availability in percent
TTO = total time in operation
TTR = total time to repair

6. Time to repair shall be the period between the time that CONTRACTOR is notified of a system failure and the time that the system has been restored to proper operation in terms of hours with an allowance for the following dead times which shall not be counted as part of the time to repair period.

a. Actual travel time for service personnel to get to the Site up to six hours per incident from the time CONTRACTOR is notified of a system failure.

b. Time for receipt of spare parts to the plant site once requested up to 24 hours per incident. No work shall be done on the system while waiting for delivery of spare parts.

c. Dead time shall not be counted as part of the system available period. The dead time shall be logged and the duration of the OAD extended for an amount of time equal to the total dead time.

7. Completion of a 30 consecutive day period without any restarts of the OAD and with a system availability in excess of 99.7 percent will constitute acceptance of the system by OWNER.

8. All parts and maintenance materials required to repair the system prior to completion of the OAD shall be supplied by CONTRACTOR at no additional cost to OWNER. If parts are obtained from the required plant spare parts inventory, they shall be replaced to provide a full complement of parts as specified.

3.4 MANUFACTURER'S SERVICES

A. On-Site Services:

1. CONTRACTOR shall retain the services of an authorized RACO representative to provide two-day on-site services to program autodialer as shown and specified, configure project specific pump station signals at OWNER's existing North Yonkers Pump Station Alarm Server, and

establish and test communication between pump station and existing Alarm Server.

3.5 TRAINING

A. General:
   1. CONTRACTOR shall retain the services of the System Supplier to provide operation and maintenance training for all instrumentation and control system equipment as specified herein.
   2. For equipment items not manufactured by the System Supplier, he shall provide for on-Site training by an authorized representative of the equipment manufacturer as part of his services. The manufacturer's representative shall be fully knowledgeable in the operation and maintenance of the equipment.
   3. CONTRACTOR shall be responsible for all costs associated with training and shall provide all required materials, texts and required supplies.
   4. Training shall conform to the requirements of Section 01 79 23, Instruction of Operations and Maintenance Personnel.

B. On-Site Training:
   1. General:
      a. Provide on-Site operation and maintenance training by System Supplier and the equipment manufacturer representatives prior to placing the equipment in continuous operation.
      b. Training courses shall include time for students to develop and demonstrate understanding of training concepts. Testing shall include hands on training with equipment.
      c. At the conclusion of each course students shall be tested on course material. Testing shall include exercises where students must demonstrate proper response to normal operational needs, emergencies and maintenance tasks. Every student shall be tested individually.
      d. Training shall accomplish the following:
         1) Provide instruction covering use and operation of the equipment to perform the intended functions.
         2) Provide instruction covering procedures for routine, preventive and troubleshooting maintenance, including equipment calibration.
         3) Explain procedures for placing the equipment in and out of operation and explain necessary actions and precautions to be taken regarding the overall plant monitoring and control system.
         4) Provide classes and field training as to how to change process control and alarm set points in all microprocessor based controllers and transmitters. Maintenance personnel shall be trained to enter passwords, programming or configuration data, etc.
   2. Primary Sensors/Transducers and Field Instruments:
      a. The services of equipment manufacturer's representatives shall be provided for a minimum of two (2) hours for each type of instrument.
      b. Training shall include:

1) Basic repair and maintenance capabilities of installed equipment.
2) Procedures for placing the equipment in and out of operation.
3) Use of any special repair equipment or software packages that are used for repair or maintenance.
4) Procedures for testing any repair before placing equipment back in service.

3.6 SUPPLEMENTS

A. The supplements listed below, following the “End of Section” designation, are part of this Specification section.

B. PLC Input/Output List:
   1. The PLC Input/Output List following the "End of Section" designation is part of this Specification section.

+ + END OF SECTION + +

+ +THIS PAGE LEFT BLANK INTENTIONALLY + +

NO.	I/O TAG	DESCRIPTION	SIGNAL TYPE	I/O TYPE	I/O LOCATION	TERMINATION LOCATION*			INPUT FROM / OUTPUT TO	DRAWING REFERENCE
						RACK	SLOT	CH.		
1	PS-WVR-JU-0001	WEAVER STREET - CONTROL PANEL - 120V POWER FAIL	DI	HARDW	PS-WVR-CP				PS-WVR-JS-0001	I-004
2	PS-WVR-JU-0002 A	WEAVER STREET - CONTROL PANEL - 24V POWER SUPPLY 1 FAIL	DI	HARDW	PS-WVR-CP				PS-WVR-JS-0002	I-004
3	PS-WVR-JU-0002 B	WEAVER STREET - CONTROL PANEL - 24V POWER SUPPLY 2 FAIL	DI	HARDW	PS-WVR-CP				PS-WVR-JS-0002	I-004
4	PS-WVR-YR-0003	WEAVER STREET - CONTROL PANEL - UPS ON BATTERY	DI	HARDW	PS-WVR-CP				UPS	I-004
5	PS-WVR-YX-0003	WEAVER STREET - CONTROL PANEL - UPS IN BYPASS MODE	DI	HARDW	PS-WVR-CP				UPS	I-004
6	PS-WVR-JL-0003	WEAVER STREET - CONTROL PANEL - UPS LOW BATTERY	DI	HARDW	PS-WVR-CP				UPS	I-004
7	PS-WVR-YD-0004	WEAVER STREET - CONTROL PANEL - DOOR OPEN	DI	HARDW	PS-WVR-CP				PS-WVR-JS-0004	I-004
8	PS-WVR-UU-0005	WEAVER STREET - CONTROL PANEL - PLC FAULT	DO	HARDW	PS-WVR-CP				AUTODIALER	I-004
9	PS-WVR-TH-0005	WEAVER STREET - CONTROL PANEL - HIGH TEMPERATURE	DI	HARDW	PS-WVR-CP				PS-WVR-TSH-0005	I-004
10	PS-WVR-ZX-0100	WEAVER STREET - BUBBLER / PRESS SELECTOR	DI	HARDW	PS-WVR-CP				HANDSWITCH	I-003
11	PS-WVR-LH-0100	WEAVER STREET - WET WELL - HI-HI LEVEL (PLC)	DO	HARDW	PS-WVR-CP				AUTODIALER	I-003
12	PS-WVR-LL-0100	WEAVER STREET - WET WELL - LO-LO LEVEL (PLC)	DO	HARDW	PS-WVR-CP				AUTODIALER	I-003
13	PS-WVR-LI-0101	WEAVER STREET - WET WELL 1 - TRANSDUCER LEVEL	AI	HARDW	PS-WVR-CP				PS-WVR-LIT-0101	I-003
14	PS-WVR-LI-0102	WEAVER STREET - WET WELL 2 - TRANSDUCER LEVEL	AI	HARDW	PS-WVR-CP				PS-WVR-LIT-0102	I-003
15	PS-WVR-YX-0103	WEAVER STREET - BUBBLER - PURGE ACTIVE	DI	HARDW	PS-WVR-CP				BUBBLER PANEL	I-003
16	PS-WVR-PL-0103	WEAVER STREET - BUBBLER - LOSS OF AIR	DI	HARDW	PS-WVR-CP				BUBBLER PANEL	I-003
17	PS-WVR-LI-0103	WEAVER STREET - BUBBLER - WET WELL LEVEL	AI	HARDW	PS-WVR-CP				BUBBLER PANEL	I-003
18	PS-WVR-LH-0105	WEAVER STREET - BACKUP FLOAT - HI-HI LEVEL	DI	HARDW	PS-WVR-CP				BACKUP FLOAT CP	I-003
19	PS-WVR-LL-0105	WEAVER STREET - BACKUP FLOAT - LO-LO LEVEL	DI	HARDW	PS-WVR-CP				BACKUP FLOAT CP	I-003
20	PS-WVR-YX-0105	WEAVER STREET - BACKUP FLOAT CONTROL - ACTIVE	DI	HARDW	PS-WVR-CP				BACKUP FLOAT CP	I-003

NO.	I/O TAG	DESCRIPTION	SIGNAL TYPE	I/O TYPE	I/O LOCATION	TERMINATION LOCATION*			INPUT FROM / OUTPUT TO	DRAWING REFERENCE
						RACK	SLOT	CH.		
21	PS-WVR-ZX-0106	WEAVER STREET - MIXER NO. 1 - IN AUTO	DI	HARDW	PS-WVR-CP				MIXER NO. 1 CP	I-003
22	PS-WVR-UU-0106	WEAVER STREET - MIXER NO. 1 - FAULT	DI	HARDW	PS-WVR-CP				MIXER NO. 1 CP	I-003
23	PS-WVR-YR-0106	WEAVER STREET - MIXER NO. 1 - RUN STATUS	DI	HARDW	PS-WVR-CP				MIXER NO. 1 CP	I-003
24	PS-WVR-HS-0106	WEAVER STREET - MIXER NO. 1 - START COMMAND	DO	HARDW	PS-WVR-CP				MIXER NO. 1 CP	I-003
25	PS-WVR-ZX-0107	WEAVER STREET - MIXER NO. 2 - IN AUTO	DI	HARDW	PS-WVR-CP				MIXER NO. 2 CP	I-003
26	PS-WVR-UU-0107	WEAVER STREET - MIXER NO. 2 - FAULT	DI	HARDW	PS-WVR-CP				MIXER NO. 2 CP	I-003
27	PS-WVR-YR-0107	WEAVER STREET - MIXER NO. 2 - RUN STATUS	DI	HARDW	PS-WVR-CP				MIXER NO. 2 CP	I-003
28	PS-WVR-HS-0107	WEAVER STREET - MIXER NO. 2 - START COMMAND	DO	HARDW	PS-WVR-CP				MIXER NO. 2 CP	I-004
29	PS-WVR-ZD-0111	WEAVER STREET - PUMP NO. 1 - CHECK VALVE OPEN	DI	HARDW	PS-WVR-CP				PS-WVR-ZSO-0111	I-003
30	PS-WVR-ZX-0111 A	WEAVER STREET - PUMP NO. 1 - IN AUTO	DI	HARDW	PS-WVR-CP				PUMP NO. 1	I-003
31	PS-WVR-ZX-0111 B	WEAVER STREET - PUMP NO. 1 - IN BYPASS	DI	HARDW	PS-WVR-CP				PUMP NO. 1	I-003
32	PS-WVR-UU-0111	WEAVER STREET - PUMP NO. 1 - FAULT	DI	HARDW	PS-WVR-CP				PUMP NO. 1	I-003
33	PS-WVR-YR-0111	WEAVER STREET - PUMP NO. 1 - RUN STATUS	DI	HARDW	PS-WVR-CP				PUMP NO. 1	I-003
34	PS-WVR-HS-0111	WEAVER STREET - PUMP NO. 1 - START COMMAND	DO	HARDW	PS-WVR-CP				BACKUP FLOAT CP	I-003
35	PS-WVR-ZD-0112	WEAVER STREET - PUMP NO. 2 - CHECK VALVE OPEN	DI	HARDW	PS-WVR-CP				PS-WVR-ZSO-0112	I-003
36	PS-WVR-ZX-0112 A	WEAVER STREET - PUMP NO. 2 - IN AUTO	DI	HARDW	PS-WVR-CP				PUMP NO. 2	I-003
37	PS-WVR-ZX-0112 B	WEAVER STREET - PUMP NO. 2 - IN BYPASS	DI	HARDW	PS-WVR-CP				PUMP NO. 2	I-003
38	PS-WVR-UU-0112	WEAVER STREET - PUMP NO. 2 - FAULT	DI	HARDW	PS-WVR-CP				PUMP NO. 2	I-003
39	PS-WVR-YR-0112	WEAVER STREET - PUMP NO. 2 - RUN STATUS	DI	HARDW	PS-WVR-CP				PUMP NO. 2	I-003
40	PS-WVR-HS-0112	WEAVER STREET - PUMP NO. 2 - START COMMAND	DO	HARDW	PS-WVR-CP				BACKUP FLOAT CP	I-003

NO.	I/O TAG	DESCRIPTION	SIGNAL TYPE	I/O TYPE	I/O LOCATION	TERMINATION LOCATION*			INPUT FROM / OUTPUT TO	DRAWING REFERENCE
						RACK	SLOT	CH.		
41	PS-WVR-FI-0120	WEAVER STREET - PUMP STATION DISCHARGE FLOW	AI	HARDW	PS-WVR-CP				PS-WVR-FIT-0120	I-003
42	PS-WVR-PI-0120	WEAVER STREET - PUMP STATION DISCHARGE PRESSURE	AI	HARDW	PS-WVR-CP				PS-WVR-PIT-0120	I-003
43	PS-WVR-LH-0130	WEAVER STREET - DRY WELL - FLOOD	DI	HARDW	PS-WVR-CP				PS-WVR-LSH-0130	I-003
44	PS-WVR-JU-0200	WEAVER STREET - GENERATOR - FAULT	DI	HARDW	PS-WVR-CP				GENERATOR PANEL	I-004
45	PS-WVR-LL-0200	WEAVER STREET - GENERATOR - LOW FUEL	DI	HARDW	PS-WVR-CP				GENERATOR PANEL	I-004
46	PS-WVR-YU-0200	WEAVER STREET - GENERATOR - RUN STATUS	DI	HARDW	PS-WVR-CP				GENERATOR PANEL	I-004
47	PS-WVR-YU-0201 A	WEAVER STREET - ATS - NORMAL POWER	DI	HARDW	PS-WVR-CP				ATS	I-004
48	PS-WVR-YU-0201 B	WEAVER STREET - ATS - EMERGENCY POWER	DI	HARDW	PS-WVR-CP				ATS	I-004
49	PS-WVR-UU-0205	WEAVER STREET - FIRE ALARM	DI	HARDW	PS-WVR-CP				FIRE ALARM PANEL	I-004
50	PS-WVR-ZX-0211 A	WEAVER STREET - INTRUSION - WET WELL STAIR HATCH	DI	HARDW	PS-WVR-CP				PS-WVR-ZSO-0211A	I-004
51	PS-WVR-ZX-0211 B	WEAVER STREET - INTRUSION - WET WELL EQUIPMENT HATCH	DI	HARDW	PS-WVR-CP				PS-WVR-ZSO-0211B	I-004
52	PS-WVR-ZX-0212 A	WEAVER STREET - INTRUSION - DRY WELL STAIR HATCH	DI	HARDW	PS-WVR-CP				PS-WVR-ZSO-0212A	I-004
53	PS-WVR-ZX-0212 B	WEAVER STREET - INTRUSION - DRY WELL EQUIPMENT HATCH 1	DI	HARDW	PS-WVR-CP				PS-WVR-ZSO-0212B	I-004
54	PS-WVR-ZX-0212 C	WEAVER STREET - INTRUSION - DRY WELL EQUIPMENT HATCH 2	DI	HARDW	PS-WVR-CP				PS-WVR-ZSO-0212C	I-004
55	PS-WVR-ZX-0213 A	WEAVER STREET - INTRUSION - ELECTRICAL BUILDING DOOR	DI	HARDW	PS-WVR-CP				PS-WVR-ZSO-0213A	I-004
56	PS-WVR-UU-0220	WEAVER STREET - WET WELL GAS MONITOR - FAULT	DI	HARDW	PS-WVR-CP				GAS RECEIVER PANEL	I-004
57	PS-WVR-AI-0221	WEAVER STREET - WET WELL GAS MONITOR - H2S	AI	HARDW	PS-WVR-CP				PS-WVR-AIT-0220A	I-004
58	PS-WVR-AI-0222	WEAVER STREET - WET WELL GAS MONITOR - COMBUSTIBLE	AI	HARDW	PS-WVR-CP				PS-WVR-AIT-0220A	I-004
59	PS-WVR-AI-0223	WEAVER STREET - WET WELL GAS MONITOR - O2	AI	HARDW	PS-WVR-CP				PS-WVR-AIT-0220B	I-004
60	PS-WVR-AI-0224	WEAVER STREET - WET WELL GAS MONITOR - CO	AI	HARDW	PS-WVR-CP				PS-WVR-AIT-0220B	I-004

NO.	I/O TAG	DESCRIPTION	SIGNAL TYPE	I/O TYPE	I/O LOCATION	TERMINATION LOCATION*			INPUT FROM / OUTPUT TO	DRAWING REFERENCE
						RACK	SLOT	CH.		
61	PS-WVR-UU-0231	WEAVER STREET - DRY WELL VENTILATION - DIFF PRESS FAULT	DI	HARDW	PS-WVR-CP				ALARM RELAY PANEL	I-004
62	PS-WVR-YR-0231	WEAVER STREET - SUPPLY FAN 1 - RUN	DI	HARDW	PS-WVR-CP				SUPPLY FAN 1	I-004
63	PS-WVR-UU-0231	WEAVER STREET - SUPPLY FAN 1 - FAULT	DI	HARDW	PS-WVR-CP				SUPPLY FAN 1	I-004
64	PS-WVR-YR-0232	WEAVER STREET - SUPPLY FAN 2 - RUN	DI	HARDW	PS-WVR-CP				SUPPLY FAN 2	I-004
65	PS-WVR-UU-0232	WEAVER STREET - SUPPLY FAN 2 - FAULT	DI	HARDW	PS-WVR-CP				SUPPLY FAN 2	I-004
66	PS-WVR-UU-0232	WEAVER STREET - WET WELL GAS DETECTED	DI	HARDW	PS-WVR-CP				ALARM RELAY PANEL	I-004
67	PS-WVR-UU-0240	WEAVER STREET - HOT BOX FAULT	DI	HARDW	PS-WVR-CP				HOT BOX	I-004

SIGNAL TYPE TOTALS (For Reference Only) :

	PS-WVR-CP
AI =	9
AO =	0
DI =	51
DO =	7
ETH =	0

++ END OF SECTION ++

SECTION 41 22 13

PORTABLE DAVIT CRANES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install portable davit cranes complete and operational.
   2. Extent of equipment is indicated on Table 41 22 13-1 - Portable Davit Crane Schedule located at the end of this Section and the Contract Drawings.
   2. CONTRACTOR shall be responsible for field verifying that the size, orientation, and final field location of the lifting equipment is appropriate for full lifting and removal of the final equipment selected and as listed in this specification from the installed position to location identified in this specification. Alignment of lifting equipment shall be directly over center of mass of installed equipment for removal. Notice of any conflicts shall be provided in written form to the ENGINEER or OWNER.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before portable davit crane Work.

B. Related Sections:
   1. Section 03 00 05, Concrete.
   2. Section 03 60 00, Grouting.
   3. Section 05 05 33, Anchor Systems.
   4. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American Gear Manufacturers Association, (AGMA).
   2. American Institute of Steel Construction, Inc., (AISC).
   3. American Society of Mechanical Engineers (ASME).
      a. ASME B30.2, Overhead and Gantry Cranes.
   4. Hoist Manufacturers Institute (HMI).
   5. Institute of Electrical and Electronics Engineers, (IEEE).
   6. National Electrical Code, (NEC).
   7. National Electrical Manufacturers Association, (NEMA).
   8. Occupational Safety and Health Administration (OSHA)

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of five years experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility
   1. Obtain all equipment included in this Section regardless of component manufacturer, from portable davit crane equipment manufacturer
   2. Portable davit crane equipment manufacturer shall review and approve or prepare all submittals for components furnished under this Section.
   3. Components shall be specifically constructed for specified service conditions and shall be integrated into overall equipment assembly by portable davit crane equipment manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Drawings showing fabrication methods, assembly, accessories, and installation details.
      b. Dimensions and required clearances.
      c. Contractor to provide documentation in the formed for dimensioned drawings demonstrating the field location of the lifting equipment is appropriate for full removal of the final equipment selected.
   2. Product Data:
      a. Manufacturer's literature, illustrations, specifications, and engineering data including:
         1) Complete description in sufficient detail to permit comparison with the product requirements in Specifications.
         2) Dimensions and required clearances.
         3) Weights.
         4) Live and dead loads.
         5) Performance characteristics.
         6) Manufacturer's installation and testing instructions.
         7) Manufacturer's standard guarantee.
   3. Testing Plans: Prior to performing tests, submit and obtain approval of test procedures for field operating tests.

B. Informational Submittals: Submit the following:
   1. Source Quality Control Submittals:

C. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Manuals:
      a. Submit complete Installation, Operation and Maintenance Manuals, including, test reports, maintenance data and schedules, description of operation, and spare parts information.

b. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 23, Operation and Maintenance Data.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.6 MAINTENANCE

A. Spare Parts:
   1. Furnish, tag and box for shipment and long-term storage the following spare parts and special tools:
      a. Spare parts and special tools as recommended by the manufacturer.
   2. Manufacturer shall furnish a list of additional recommended spare parts for an operating period of one year. The list shall describe each part, the quantity recommended, and the current unit price of the part.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Provide equipment of one of the following:
   1. Thern, Inc., Winona, MN.
   2. Or equal.

2.2 EQUIPMENT PERFORMANCE

A. Design Criteria:
   1. Design Factor: Designed with an ultimate design factor greater than 3:1 for all components including the lifting winch, brackets, and base.
   2. Lift Capacity: Davit crane shall have a lift capacity (minimum) as indicated in Table 41 22 13-1 - Portable Davit Crane Schedule with the boom fully extended.

3. Hook Reach: Boom shall telescope up to four different lengths allowing a maximum hook reach of at least 42 inches measured from mast center to hook center.
4. Hook Height: Hook height shall be adjustable by moving the boom up or down between 5 degrees above horizontal and 45 degrees from vertical, with a minimum of 48 inches between the lowest position and the highest position with the boom fully extended.
5. Boom Angle: Boom angle shall be adjustable at all times, with a hand operated screw jack acting to raise or lower the boom between 5 degrees above horizontal and 45 degrees from vertical.
6. Boom Sheave: Wire rope shall pass over a sheave at the end of the boom. Sheave shall have a bronze bearing.
7. Clearance: Minimum height of the lowest portion of the boom shall be 36 inches between mounting surface and the underside of the boom in all base configurations. See Table 41 22 13-1 - Portable Davit Crane Schedule for clearance information.
8. Rotation: Mast and boom shall rotate 360 degrees in the base on pin bearing and bearing sleeve, with a rotational handle attached to mast to facilitate rotation.
9. Fastening Pins: Crane components shall be fastened together using stainless steel clevis style pins, secured with lynch pins with lanyards fastening the lynch pins to primary structural components.
10. Portability: Davit crane shall break down into portable components with no single component weighing more than 75 pounds. Carrying handles shall be welded to mast and boom. Shall be for use with a permanently mounted base.
11. Winch Location: Lifting winches shall be located such that the center point of the drive shaft is opposite the centerline of the mast from the hook.

2.3 MATERIALS

A. Davit Crane:
   1. General:
      a. Provide the quantity as indicated in Table 41 22 13-1 - Portable Davit Crane Schedule.
   2. Material: Type 304 stainless steel.

B. Base:
   1. General
      a. Provide base type and quantity as indicated in Table 41 22 13-1 - Portable Davit Crane Schedule.
      b. Base shall allow for removal of the mast.
      c. Base shall allow for the davit cranes to rotate and to be locked in place.
   2. Materials and Construction:
      a. Material: Type 304 Stainless Steel.
      b. Bearings: Crane base shall have a pin bearing to support the end of the mast and a Nyloil MDX bearing sleeve to support the mast at the top of the base.

C. Winch:
   1. Provide manual or electric winch as indicated in Table 41 22 13-1 - Portable Davit Crane Schedule for each portable davit crane.
   2. Manual Winch:
      a. Gearing: Machine-cut spear gears with gear guards.
      b. Bearing: Bronze bushings and radial ball bearings.
      c. Brake: Automatic Weston-style break able to stop and hold the load automatically if the winch handle is released.
      d. Handle: Adjustable handle mounted securely to the drive shaft.
      e. Cable Anchor: Quick disconnect anchor equipped with a swaged ball fitting for quick attachment and detachment of the wire rope.

D. Wire Rope:
   1. Provide one complete wire rope and hook assembly for each portable davit crane provided.
   2. Provide wire rope of sufficient length to provide the required lift above floor as indicated in Table 41 22 13-1 - Portable Davit Crane Schedule.
   3. Hooks: Latch type hooks shall be used and shall be either nonrotating eye type or swivel type to allow 360-degree rotation under all load conditions.
   2. Material:
      1. Wire Rope: Type 304 stainless steel, minimum 1/4-inch thick.
      2. Hooks: Heat-treated drop forged Type 304 stainless steel.

2.4 ACCESSORIES

A. Anchorage: Furnish anchor bolts and nuts of ample size and strength for the purpose intended, sized by the equipment manufacturer. Provide hooked anchor bolts for direct embedment during placement of concrete. Anchor bolt material shall be Type 316 stainless steel conforming to the requirements of Section 05 05 33, Anchor Systems.

B. Wire Rope Keeper:
   1. Provide wire rope keeper for each portable davit crane provided.
   2. Wire rope keeper will hold wire rope when not in use.
   3. Material: Type 304 stainless steel.

2.5 IDENTIFICATION

A. Each unit of davit crane and base equipment shall bear an inscription, easily readable from the operating floor, showing the rated capacity of the equipment (in tons or pounds) and control identification.

B. Provide brass or stainless steel nameplates for all systems and component subassemblies. Include, at a minimum, the following information:
   1. Manufacturer and model number.
   2. Date of manufacture with all pertinent ratings and operation information.
   3. Certification stamp or label for all applicable codes.

C. Health and Safety: All appurtenances, caution markers, and appliances necessary to satisfy applicable safety laws and codes shall be provided.

2.6 SURFACE PREPARATION AND PAINTING

A. Prepare and prime coat in accordance with manufacturer’s standard.

B. Surface preparation and painting shall conform to the requirements of Section 09 91 00, Painting.

C. Finish paint ferrous metal surfaces in the shop using the manufacturer's approved standard finish system. Finish system shall be compatible with the primer specified in Section 09 91 00, Painting

D. Coat machined, polished, and non-ferrous metal surfaces and similar unpainted surfaces with corrosion prevention compound which shall be maintained during storage and until equipment begins operation.

E. Stainless Steel: Do not paint stainless steel.

2.7 SOURCE QUALITY CONTROL

A. Shop Tests:
   1. Perform factory load test up to 125% of rated load.
   2. Shop load test certificates shall be submitted prior to equipment delivery

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions under which products are to be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

B. Inspect and verify that no part of the building, structure, piping, mechanical systems including ductwork, electrical systems including lighting and conduit, or other elements that will interfere with proper operation of davit crane.

3.2 INSTALLATION

A. General: Install in a manner and to the tolerances recommended by the equipment manufacturer and approved Shop Drawings.

B. Provide all required lubricants for initial operation.

3.3 FIELD PAINTING

A. Field painting shall conform to the requirements of Section 09 91 00, Painting.

B. Stainless Steel: Do not paint stainless steel.

3.4 FIELD TESTING / QUALITY CONTROL

A. All equipment will be given running tests by Contractor at the job Site following installation of the equipment and controls. Should the tests indicate any malfunction, CONTRACTOR shall make any necessary repairs and adjustments. Such tests and adjustments shall be repeated until, in the opinion of the ENGINEER, the installation is complete and the equipment is functioning properly and accurately, and is ready for permanent operation.

B. Field testing shall be performed in the presence of the ENGINEER and manufacturer's representative.

C. CONTRACTOR shall provide a minimum of 14 days notice prior to performing field testing.

D. Field Tests:
   1. Perform load tests in the presence of ENGINEER.
   2. Weights used in load testing shall be as specified for each location.
   3. Load Test Report: Submit results of load testing as report that lists test performed, data collected, and results of each test.

3.5 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. Provide a factory-trained representative for visits for the following activities:
   1. Installation Supervision and Field Testing – 1 visit.
   2. Training – 1 Visit.

B. Each visit shall be a minimum of 8 hours on site, unless otherwise specified.

C. Representative shall revisit the Site as often as necessary until all trouble is corrected and the installation and operation are entirely satisfactory at no additional cost to the OWNER. All costs, including travel, lodging, meals and incidentals, for additional visits shall be at no additional cost to the OWNER.

D. The factory-trained representative shall provide the Supplier's Installation Certificate in accordance with Section 01 75 11, Checkout and Startup Procedures.

E. Provide operation and maintenance personnel training services in accordance with Section 01 79 23, Instruction of Operations and Maintenance Personnel.

+ + END OF SECTION + +

TABLE 41 22 13 -1
PORTABLE DAVIT CRANE SCHEDULE

Designation:	**Weaver Street Pumping Station**
Location:	Wet Well Top Slab
Quantity:	1
Required Minimum Capacity:	500 lbs
Required Lift Below Floor:	30 feet
Overhead Clearance:	Unrestricted
Base Type:	Pedestal
Base Quantity:	1
Winch Type:	Manual

SECTION 43 21 13.12

CENTRIFUGAL END SUCTION PUMPS DRY PIT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install end suction dry pit centrifugal pumps complete and operational with motors, control equipment and accessories at the Weaver Street Pumping Station as shown and specified.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the centrifugal end suction pumps-dry pit Work.

C. Related Sections:
   1. Section 03 60 00, Grouting.
   2. Section 05 05 33, Anchor Systems.
   3. Section 40 05 93, Common Motor Requirements for Process Equipment.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American Gear Manufacturers' Association, (AGMA).
   2. American National Standards Institute, (ANSI).
      a. B16.1: Standard for Cast Iron Pipe Flanges and Flanged Fittings, 125 lb.
   3. American Society for Testing Materials, (ASTM).
      a. ASTM A 48: Standard Specification for Gray Iron Castings.
      b. ASTM A743: Standard Specification Iron-Chromium Nickel, Corrosion Resistant.
   4. Standards of American Water Works Association, (AWWA).
   5. Institute of Electrical and Electronic Engineers, (IEEE).
   6. Standards of the Hydraulic Institute, (HI).
      a. HI 9.6.5: Rotodynamic Pumps Guidelines
      b. HI 14.6: Hydrodynamic Pumps for Hydraulic Performance Acceptance Tests.
      c. HI 11.6: Submersible Pump Tests
   7. National Electrical Code, (NEC).
   8. Standards of the National Electrical Manufacturers Association, (NEMA).
   9. National Sanitation Foundation, (NSF).

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of twenty years experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single centrifugal end suction pumps-dry pit manufacturer.
   2. The centrifugal end suction pumps-dry pit equipment manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the centrifugal end suction pumps-dry pit equipment manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Product Data:
      a. Manufacturer’s literature, illustrations, specifications, paint certification (if required) and engineering data including; dimensions, materials, size, weight, and part lists for all components in sufficient detail to allow an item-by-item comparison with the Contract Documents.
      b. Pump performance data and curves showing overall pump efficiencies, required net positive suction head, allowable suction lift, flow rate, head, brake horsepower, motor horsepower, speed and shut-off head.
      c. Motor Data: Furnish certified motor data sheet for previously tested, electrically duplicate motor to that specified, including the following:
         1) Speed-torque relationship.
         2) Efficiency at 1/2, 3/4, and full load.
         3) Slip at full load.
         4) Running light, full load and locked rotor current.
         5) Temperature rises and results of dielectric tests.
         6) Bearing type and lubrication medium
         7) Insulation class and temperature ratings.
         8) Additional motor test data in accordance with Section 40 05 93, Common Motor Requirements for Process Equipment.
   2. Shop Drawings:
      a. Fabrication, assembly, installation and wiring diagrams.
      b. Motor Shop Drawings in accordance with Section 40 05 93, Common Motor Requirements for Process Equipment
   3. Testing Plans, Procedures, and Testing Limitations:
      a. Provide pump Supplier’s proposed shop testing plan, including complete list of testing facility limitations. At a minimum, shop tests shall include

performance test, hydrostatic test, motor electrical testing, testing for vibration, and NPSH.

b. Provide proposed field testing plan.

B. Informational Submittals: Submit the following:

1. Source Quality Control:
   a. Certified results of shop testing for complete pump and motor unit.
2. Manufacturer's instructions:
   a. Provide Supplier's instructions for handling and installing products.
   b. Setting drawings, templates, and directions for installing anchor bolts and other anchorages.
3. Field Quality Control Submittals:
   a. Results of field testing.
   b. Submit a written report of the results of each visit to Site by pump manufacturer's service representative, including purpose and time of visit, tasks performed, and results obtained.

C. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data:
   a. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation and spare parts information.
   b. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 23, Operations and Maintenance Data.
2. Warranty Documentation:
   a. Manufacturer's Standard Warranty.
   b. Special Warranty, if specified.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:

1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to prevent delay of the Work.
2. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:

1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
2. Comply with Section 01 66 00, Product Storage and Handling Requirements.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.6 WARRANTY

A. The pumps shall be provided with the manufacturer's written 60 months (5 years) warranty against defects in materials and or workmanship. Replacement value of items regularly subject to wear in normal use, such as seals, bearings, impellers, rotors, and stator, may be prorated. All other equipment shall be warrantied for a period of 18 months starting at the time of equipment delivery to the job site or 12 months after initial operation.

PART 2 - PRODUCTS

2.1 EQUIPMENT PERFORMANCE

A. Pumps shall be dry-pit submersible, vertical, non-clogging, constant speed, centrifugal type.
   1. Pumps shall be suitable for continuous operation in wet or dry pit applications without overheating.
   2. Pumps shall be capable of at least 15 evenly spaced starts per hour.
   3. Pumps shall comply with the minimum design conditions specified below and shall be specially designed, constructed, and installed for the service intended:

	Design Conditions	**Weaver Street Pumping Station**
a.	Location:	Dry well
b.	Use:	Municipal wastewater
c.	Number required:	2
d.	Design Flow, (gpm):	1,400
e.	Design TDH, (ft.):	51.5
f.	Minimum hydraulic efficiency at Design, (percent):	72.0
g.	Minimum motor efficiency at Design (percent):	Premium efficiency motors
h.	Maximum motor, (Hp):	30
i.	Maximum Speed, (rpm):	1,800
j.	Minimum Solids Passing (in.):	3 (sphere)
k.	Available NPSH at Design (ft.):	--
l.	Liquid Pumped:	Raw wastewater
m.	Temperature, (^{o}F):	35 to 80
n.	Drive Type:	Constant
o.	Electrical Service;	208 V, 3 Phase, 60 Hz

2.2 MANUFACTURERS

A. Products and Manufacturers: Provide one of the following:
   1. Sulzer/ABS - Model XFP 155J
   2. Xylem/Flygt - Model NT3171

3. Or equal.

2.3 DETAILS OF CONSTRUCTION

A. Pumping Unit Components:
   1. General:
      a. Construct pumps for fluid service specified.
      b. Pumping units shall include stand-alone cooling jacket with integral self-contained cooling system.
   2. Impellers:
      a. Type: Semi-open, single- or multi- vane, self-cleaning, end suction, non-clog type.
      b. Material: ASTM A532 Alloy III A 25% Chrome Cast Iron with leading edges to be hardened to Rockwell C $\geq$ 60 RHC or ASTM A-48 Class 35B Grey Cast Iron.
      c. Assembly: Mounted on the motor shaft. Couplings shall not be accepted.
   3. Pump Shafts:
      a. Material: AISI Series 400 stainless steel.
      b. Maximum Shaft Deflection: 0.002-inch.
   4. Casing:
      a. Casing shall have centerline discharge as shown the Contract Drawings. CONTRACTOR is responsible for ensuring that the pump casing can be fitted within the pumping station layout as shown on the Contract Drawings.
      b. Provide casing with Class 125 inlet and outlet flanges in accordance with ANSI B16.1.
      c. Provide casing with three cast lifting eyelets capable of bearing the weight of the pumping unit.
      d. Provide Type 316 stainless steel handle on each pump capable of bearing the weight of the pumping unit.
      e. Material: ASTM A-48, Class 35B grey cast-iron.
   5. Wear Rings and Wear Plates:
      a. Provide wear ring or wear plate system for sealing between the volute and suction inlet of the impeller.
      b. Wear Ring:
         1) Casing wear ring shall be chrome steel, hardened to Rockwell 60 HRC.
         2) Impeller wear ring shall be ASTM A532 Alloy III A 25% Chrome Cast Iron hardened to Rockwell C $\geq$ 60 RHC
      b. Wear Plate Materials:
         1) ASTM A-48, Class 35B grey cast iron.
         2) Wear plate shall be field adjustable.
   6. Bearings:
      a. Pump and motor shaft shall rotate on two sealed and permanently grease lubricated bearings.
      b. Upper bearing shall be single row ball bearing.
      c. Lower bearing shall be double row angular contact ball bearing. Single row lower bearings are not acceptable.

d. Minimum L10 bearing life of 100,000 hours.

7. Mechanical Seals:
   a. The shaft shall be sealed by a tandem mechanical shaft seal system consisting of two seals, each having an independent spring system.
   b. Lower seal unit shall consist of one stationary seal and one positively driven rotating ring. Mounting of the lower seal on the impeller hub is not acceptable.
   c. Upper seal unit shall consist of one stationary seal and one positively drive rotating ring.
   d. Material: Corrosion resistant Iidustrial duty silicon carbide.
8. Pump Drive Units:
   a. Motors:
      1) Provide premium efficiency motor in accordance with IEC IE3 and conform to the requirements of Section 40 05 93, Common Motor Requirements for Process Equipment.
      2) Motor Enclosure Type: TEFC.
      3) Motors shall be in accordance with all current applicable standards of NEMA, IEEE, AFBMA, NEC, and ANSI.
      4) Motors shall be normal starting torque, normal slip, squirrel cage induction type.
      5) Motors shall be capable of carrying full load current continuously without injurious temperature rise in an ambient temperature of 40°C.
      6) Motors shall be provided with a service factor of 1.3.
      7) Motors shall be of sufficient size so that there will be no overload on the motor above rated nameplate horsepower under any condition of operation from shut-off to zero head, unless otherwise specifically permitted in this Section.
      8) Motor thrust bearings shall be adequate to carry continuous thrust loads under all conditions of pump operation from zero head to shut-off.
      9) Locked rotor currents shall be as specified in NEMA standards.
      10) Lubrication may be grease or oil type.
      11) Stator shall be insulated with Class H insulation.
   b. Cooling System:
      1) Pumping units shall include stand-alone cooling jacket with integral self-contained cooling system. Auxiliary cooling systems like fans or blowers are not acceptable.
      2) An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket.
      3) The cooling system shall have one fill port and one drain port integral to the cooling jacket.
      4) Material: epoxy coated steel.
9. Pump Drive Unit Protective Devices:
   a. Leakage Detection:
      1) Provide a leakage sensor located in leakage chamber below the main bearing.

2) Provide sensor within power cable junction chamber within motor to detect the presence of water.

b. Motor Stator Thermal Protection:
   1) Provide thermal switches embedded in the stator to provide motor thermal protection for each winding.
   2) Provide dry contacts to stop the motor and active a “Motor High Temperature” alarm at the Pump Station Control Panel.

c. Motor Overload Protection: Provide motor overload protection and provide a dry contact to stop the motor and active a “Motor Overload” alarm at the Pump Station Control Panel.

d. Provide a separate monitoring relay to monitor the pump drive unit protective devices. Contractor shall mount monitor relay, provided by the pump manufacturer, in the pump starter.

10. Power and Control Cable:
    a. Provide submersible power and control cables for each pumping unit.
    b. The power cable shall be sized according to NEC and ICEA standards.
    c. The cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.
    d. Outer jacket shall be oil resistant chlorinated polyethylene rubber.

B. Accessories
   1. Suction Elbow:
      a. Provide integrated 90-degree suction elbow meeting the requirements of Section 40 05 19, Ductile Iron Process Pipe.
      b. Provide suction elbow with minimum 5-inch wide inspection and cleanout cover. Cleanout cover to be secured on machine face and secured with Type 316 studs and nuts.
      c. Provide flanged connections drilled according to ANSI B16.1-89.
      d. Provide plug tap for suction gage connection in each suction elbow.
   2. Support Base:
      a. Provide each pump with an integral structural steel or cast iron support base capable of supporting the entire pumping unit weight.
      b. Provide baseplate with means for collecting and draining oil and water.
      c. The stand shall be fastened to the floor with four anchor bolts.
   3. Nameplates:
      a. Brass or stainless steel nameplates giving the manufacturer's model and serial number, rated capacity, head, speed and all other pertinent data shall be attached to the pump.
   4. Anchor bolts and anchorage devices per Section 05 05 33, Anchor Systems.

2.5 CONTROLS AND ACCESSORIES

A. Pump station controls shall be provided by the CONTRACTOR.

2.6 TOOLS AND SPARE PARTS

A. Each pump shall be furnished with the following:
   1. One mechanical seal or packing for each gland.

2. One set of gaskets.
3. One shaft sleeve.
4. Two sets of special tools required for normal maintenance or operation.

B. Provide one complete spare pumping unit.

C. Spare parts shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the OWNER at the conclusion of the project.

2.7 PAINTING

A. Pumps, motors, drives, frames, baseplates, appurtenances, etc., shall receive manufacturer's standard finish paint system prior to shipment.

B. Machined, polished, and non-ferrous surfaces shall be coated with corrosion prevention compound.

C. Field painting shall conform to the requirements of Section 09 91 00, Painting.

2.8 SOURCE QUALITY CONTROL

A. Shop Tests:
1. Pump casings shall be hydrostatically tested to twice the discharge head or 1-1/2 times the shutoff head, whichever is greater.
2. Running Test: Pump assembly shall be operated from zero to maximum capacity as shown on the approved curve. Results of the test shall be shown in a plot of test curves showing head, flow, horsepower, efficiency, and current. Readings shall be taken at a minimum of five evenly spaced capacity points including shut-off, design point and minimum head for which pump is designed to operate. Hydraulic performance test shall be in accordance with HI 11.6.
3. Each test shall be witnessed by a Registered Professional Engineer, who may be an employee of the manufacturer. The Registered Professional Engineer shall sign and seal all copies of curves and shall certify that hydrostatic tests were performed. Tests shall be conducted in conformance with applicable methods described in Section A6 of AWWA E101.
4. Pumps shall not be shipped until the ENGINEER has approved the test reports.

PART 3 - EXECUTION

3.1 EXAMINATION / PREPARATION

A. CONTRACTOR shall verify that structures, pipes and equipment are compatible.

B. Make adjustments required to place system in proper operating condition.

3.2 INSTALLATION

A. Manufacturer's representative shall check and approve the installation prior to operation. Manufacturer's representative shall field test and calibrate the equipment to assure that the system operates to the OWNER'S satisfaction.

B. All pumping units shall be installed on concrete bases and secured with anchor bolts in accordance with the manufacturer's recommendations and as shown. The concrete bases shall be poured up to 1-inch below the metal bases or soleplates. Concrete work and grout shall be in accordance with Division 03, Concrete. The base with the equipment mounted thereon, or the soleplate, shall then be accurately shimmed to grade and the spaces between filled with an approved non-shrink grout. After the grout has reached its initial set, exposed edges shall be cut back 1/2-inch and the edges neatly finished with 1 to 2 cement mortar. Where channel baseplates are used, the void inside the channel shall be filled with non-shrink grout and the open ends plastered with 1 to 2 cement mortar.

C. Neatly placed 1-inch hard copper pipe shall be provided for each non-submersible pump to convey leakage to nearest drainage inlet.

D. Installation shall include furnishing and applying an initial supply of grease and oil, recommended by the manufacturer.

E. Support piping independent of pump.

F. Check and align all pump, motor and flexible shafting.

3.3 FIELD TESTING / QUALITY CONTROL

A. All equipment will be given running tests by CONTRACTOR at the job Site following installation of the equipment and controls. Should the tests indicate any malfunction, CONTRACTOR shall make any necessary repairs and adjustments. Such tests and adjustments shall be repeated until, in the opinion of the ENGINEER, the installation is complete and the equipment is functioning properly and accurately, and is ready for permanent operation.

B. Field testing shall be performed in the presence of the ENGINEER and manufacturer's representative.

C. CONTRACTOR shall provide a minimum of 14 days notice prior to performing field testing.

D. Field Tests:
   1. Field test equipment and its controls in local mode, followed by demonstrating proper operation and controls in automatic mode. Total duration of testing shall be four hours, continuous and uninterrupted, in automatic mode.
   2. Demonstrate that the pumping unit can deliver the specified design flow rate

and pressure.
   a. Record the flow rates and corresponding total dynamic head.
   b. Flow rates shall be verified using a calibrated flow meter.
   c. Total dynamic head shall be read from the pump discharge pressure gauges.
3. Demonstrate the pump can perform at the without overheating or overloading.
   a. Record motor currents throughout the test.
4. Demonstrate the pump can perform without excessive vibrations.
5. Demonstrate the that each part and component of system individually and all parts and components together function properly in manner intended.
6. Conform to applicable provisions of ANSI/HI 9.6.5.
7. Make adjustments required to place system in proper operating condition.

3.4 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. Provide a factory-trained representative for visits for the following activities:
   1. Installation Supervision – 1 visit.
   2. Field Testing – 2 visits.
   3. Start-Up – 1 visit.
   4. Training – 1 Visit.

B. Each visit shall be a minimum of 8 hours on site, unless otherwise specified.

C. Representative shall revisit the Site as often as necessary until all trouble is corrected and the installation and operation are entirely satisfactory at no additional cost to the OWNER. All costs, including travel, lodging, meals and incidentals, for additional visits shall be at no additional cost to the OWNER.

D. The factory-trained representative shall provide the Supplier's Installation Certificate in accordance with Section 01 75 11, Checkout and Startup Procedures.

E. Training: Furnish services of qualified factory trained specialists from manufacturer to instruct Owner's operations and maintenance personnel in recommended operation and maintenance of products. Training requirements, duration of instruction, and other qualifications shall be per Section 01 79 23, Instruction of Operations and Maintenance Personnel.

+ + END OF SECTION + +

SECTION 43 26 23

STAINLESS STEEL SLIDE GATES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install stainless steel slide gates and appurtenances complete and operational.
   2. Included are stainless steel slide gates, anchorage systems and all appurtenances.
   3. Extent of the equipment is shown on the Stainless Steel Slide Gate Schedule located at the end of this Section and the Contract Drawings.

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the stainless steel slide gates Work.

C. Related Sections:
   1. Section 03 00 05, Concrete
   2. Section 03 60 00, Grouting.
   3. Section 05 05 33, Anchor Systems.
   4. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American Society for Testing and Materials, (ASTM).
      a. ASTM A240, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
      b. ASTM A276, Standard Specification for Stainless Steel Bars and Shapes.
      c. ASTM 380, Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
      d. ASTM B584, Specification for Copper Alloy Sand Castings for General Applications.
      e. ASTM D2000, Standard Classification System for Rubber Products in Automotive Applications.
      f. ASTM D4020, Standard Specification for Ultra-High Molecular Weight Polyethylene Molding and Extrusion Materials.
      g. ASTM F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

h. ASTM F594, Standard Specification for Stainless Steel Nuts.

2. American Water Works Association, (AWWA).
   a. AWWA C561, Fabricated Stainless Steel Slide Gates.
3. American Welding Society (AWS).
   a. AWS D1.6, Structural Welding Code – Stainless Steel.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer shall have a minimum of fifteen (15) years of experience of producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.
   2. Stainless steel slide gates shall be the product of one manufacturer.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single stainless steel slide gate manufacturer.
   2. The stainless steel slide gate equipment manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this Section.
   3. All components shall be specifically designed for the specified service and shall be integrated into the overall assembly by the stainless steel slide gate equipment manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Fabrication, assembly and installation diagrams.
      b. Setting drawings, templates, and directions for the installation of anchor bolts and other anchorages.
   2. Product Data:
      a. Manufacturer's literature, illustrations, specifications and engineering data.
      b. Deviations from the Contract Documents.
      c. Lubricant Specification: Furnish a lubricant specification for the type and grade necessary to meet the requirements of the equipment.

B. Informational Submittals: Submit the following:
   1. Support Design Information:
      a. Submit for record purposes only the weight of each slide gate and expected opening and closing thrust loads on the supporting structure.
   2. Shop Test Results:
      a. Submit results of required shop tests.
   3. Field Test Results:
      a. Submit a written report giving the results of the field tests required.

C. Closeout Submittals:
   1. Operation and Maintenance Manuals:
      a. Submit complete Installation, Operation and Maintenance Manuals including, test reports, maintenance data and schedules, description of operation and spare parts information.
      b. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 23, Operations and Maintenance Data.
   2. Warranty Documentation:
      a. Manufacturer's Standard Warranty.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.
   2. Handle all stainless steel slide gates and appurtenances properly, in accordance with manufacturer's recommendations. Stainless steel slide gates, which are distorted or otherwise damaged, will not be acceptable. Protect all bolt threads and ends from damage.
   3. Slide gate frames shall be shipped fully assembled with the invert member welded to the side frames and the slide installed in the frame.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Store all mechanical equipment in covered storage off the ground and prevent condensation.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Engineer, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.6 MAINTENANCE

A. Special Tools:
   1. Furnish two sets of any special tools required for normal operation and maintenance.
   2. Special tools shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the Owner at the conclusion of the Project.

B. Lubricants:
   1. Furnish lubricant and oil and grease as required for initial operation. Provide products recommended by the manufacturer.

1.7 WARRANTY

A. Provide the manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 EQUIPMENT PERFORMANCE

A. General:
   1. Design stainless steel slide gates to safely withstand conditions listed in the Stainless Steel Slide Gate Schedule, located at the end of the Section.
   2. Leakage shall not exceed 0.05 gpm/ft of wetted seal perimeter in seating head and unseating head conditions.
   3. Bolts, studs, cap screws, and adjusting screws shall be of ample section to withstand the force created by operation of the gate under a full head of water.
   4. Downward opening stainless steel slide gates shall be capable of being lowered to an elevation below the invert of the channel or opening.
   5. Stainless steel slide gates shall open to not less than 6-inches above the maximum water level in the channel in which they are installed.

2.2 MANUFACTURERS

A. Stainless Steel Slide Gates:
   1. Rodney Hunt Company, Orange, MA.
   2. Waterman Industries, Exeter, CA.
   3. Hydrogate, Denver, CO.
   4. Whipps, Inc, Athol, MA.
   5. Or approved equal.

2.3 MATERIALS

A. General:
   1. Slide gates shall be manufactured in accordance with AWWA C561.
   2. Materials for each slide gate component shall confirm to the following:

Component	Materials
Frame Assembly and Retainers	Type 304L Stainless Steel, ASTM A240
Slide and Stiffeners	Type 304L Stainless Steel, ASTM A240
Stem	Type 304 Stainless Steel, ASTM A276
Yoke	Type 304 Stainless Steel, ASTM A276
Anchor Studs	Type 316 Stainless Steel, ASTM A276
Fasteners, and Nuts	Type 316 Stainless Steel, ASTM F593 / ASTM F594
Invert Seal	Neoprene or EPDM ASTM D2000

Component	Materials
Seat/Seals and Facing	Ultra-High Molecular Weight Polyethylene ASTM D4020
Lift Nuts	Bronze ASTM B584 Alloy 865
Pedestals and Wall Brackets	Type 304L Stainless Steel, ASTM A240
Operator Housing	Cast Aluminum or Ductile Iron

3. All welds shall be performed by welders with AWS D1.6 certification.

B. Frame:

1. The frame assembly, including the guide members, invert member, yoke member, and top seal member shall be constructed of formed stainless steel plate with a minimum thickness of 1/4-inch.
2. The structural portion of the frame that incorporates the seat/seals shall be formed into a one-piece shape for rigidity. Guide members that consist of two or more bolted structural members are not acceptable. Guide member designs where water loads are transferred through the assembly bolts are specifically not acceptable.
3. Gussets shall be provided as necessary to support the guide members in an unseating head condition. The gussets shall extend to support the outer portion of the guide assembly and shall be positioned to ensure that the load is transferred to the anchor bolts.
4. The frame shall extend to accommodate the entire height of the slide when the slide is in the fully opened position on upward opening slide gates or downward opening weir gates.
5. On self-contained gates, a yoke shall be provided across the top of the frame. The yoke shall be formed by two structural members affixed to the top of the side frame members to provide a one-piece rigid assembly. The yoke shall be designed to allow removal of the slide.
6. A rigid stainless-steel invert member shall be provided across the bottom of the opening. The invert member shall be of the flush bottom type on upward opening gates.
7. A rigid stainless steel top seal member shall be provided across the top of the opening on gates designed to cover submerged openings.
8. Mounting style shall be as shown on the Contract Drawings and specified in the Stainless Steel Slide Gate Schedule.
    a. Wall mounted or wall thimble mounted gates shall have a flange frame. The guides for the flange frames shall have a minimum weight of 13 pounds per foot. The portion of the guides where the anchor bolts penetrate shall have a minimum thickness of ½-inch. Flat frames are not acceptable.
    b. Provide ANSI 125# drilling for gates mounted to pipe flanges.

C. Slide:

1. The slide and reinforcing stiffeners shall be constructed of stainless-steel plate. All structural components shall have a minimum thickness of 1/4-inch. The portion of the slide that engages the frame shall have a minimum thickness of ½-inch.

2. Provide reinforcing to limit deflection under full head to not more than 1/360 of the span or 1/16 inch, whichever is less, under the maximum design head.
3. When the width of the gate opening in feet multiplied by the maximum design head in feet is greater than 80 square feet the portion of the slide member that engages the guide shall be 1/2" thick. When the width of the gate opening in feet multiplied by the maximum design head in feet is greater than 120 square feet, the portion of the slide that engages the guide members shall be of a "thick edge" design. The thick edge portion of the slide shall have a minimum thickness of 2.5 inches.
4. Reinforcing stiffeners shall be welded to the slide and mounted horizontally. Vertical stiffeners shall be welded on the outside of the horizontal stiffeners for additional reinforcement.
5. The stem connector shall be constructed of two angles or plates. The stem connector shall be welded to the slide. A minimum of two bolts shall connect the stem to the stem connector.

D. Stem:
1. A threaded operating stem shall be utilized to connect the operating mechanism to the slide. The stem shall be threaded to allow full travel of the slide. The threaded portion shall engage the operating nut in the actuator.
   a. The threaded portion of the stem shall have a minimum outside diameter of 1-1/2 inches. Stem extension pipes are not acceptable.
   b. The threaded portion of the stem shall have machine rolled threads of the full depth Acme type with a 16 microinch finish or better. Stub threads are not acceptable.
   c. Stems of more than one section shall be joined by stainless steel couplings. The coupling shall be bolted to the stems.
2. Provide rising or non-rising stems as indicated in the Stainless Steel Slide Gate Schedule.
   a. Provide rising stems with an adjustable stop collar on the stem above the floorstand lift nut.
3. The stem shall be constructed of solid stainless steel bar for the entire length, the metal having a tensile strength of not less than 75,000 psi.
4. Design stem to transmit in compression at least 2-1/2 times the rated output of the operating mechanism with an 40-pound effort on the crank or handwheel. Determine the critical buckling load using the Euler column formula, using C = 2.
5. Design stem to withstand the tension lead caused by the application of a 40 lb effort on the crank or handwheel without exceeding 1/5 of the ultimate tensile strength of the stem material.
6 Maximum L/R ratio for the unsupported part of the stem shall not exceed 200.

E. Seals
1. Provide self-adjusting seal system to restrict leakage in accordance with the requirements of this Specification.
2. All gates shall be equipped with ASTM D4020 UHMW polyethylene seat/seals to restrict leakage and to prevent metal to metal contact between the frame and slide.

3. The seat/seals shall extend to accommodate the 1-1/2 x the height of the slide when the slide is in the fully closed or fully opened position.
4. All upward opening gates shall be provided with a resilient seal to seal the bottom portion of the gate. The seal shall be attached to the invert member or the bottom of the slide and it shall be held in place with stainless steel attachment hardware.
5. The seal system shall be durable and shall be designed to accommodate high velocities and frequent cycling without loosening or suffering damage.
6. All seals must be bolted or otherwise mechanically fastened to the frame or slide. Arrangement with seals that are force fit or held in place with adhesives are unacceptable.
7. The seals shall be mounted so as not to obstruct the water way opening.
8. Gates that utilize rubber "J" seals or "P" seals are not acceptable.
9. Gates that utilize adjustable wedges, wedging devices or pressure pads are not acceptable.

F. Yoke (For Self Contained Type Gates):
1. Furnish tops of the extended guides with a yoke for mounting of the lifting device.
2. Construct the yoke of structural shapes of sufficient strength to take the full thrust created by operating the gate under the maximum specified head.
3. Yoke deflection shall not exceed 1/360 of the gate width or a maximum of 1/4-inch, whichever is less at maximum operating load.
4. Attach the yoke to the framework by bolting or welding to permit removal of the gate slide and stem.

2.4 APPURTENANCES

A. Stem Guides:
1. Stem guide shall be provided when necessary to ensure that the maximum L/R ratio for the unsupported part of the stem is 200 or less. Location and quantity of stem guides shall be determined by the manufacturer and included in the shop drawing submittal.
2. Stem guides shall be fabricated from stainless steel and shall be equipped with UHMW or bronze bushings .
3. Guides shall be adjustable in two directions and shall be spaced so that stems have a maximum unsupported length of 84-inches.

B. Anchor Bolts:
1. Provide stainless steel anchor bolts as required for stem guides, floorstands, and all equipment or appurtenances, which must be secured to concrete walls or floors. Anchor bolts shall be of ample size and strength for the purpose intended and shall be furnished by the manufacturer. Anchor bolts shall be hooked and provided for direct embedment during placement of concrete.

C. Manual Operators:
1. General:

a. Manual operation shall be by handwheel or crank operated floorstand or benchstand as shown and specified on the Stainless Steel Slide Gate Schedule, unless otherwise noted. The operator shall be mounted on the yoke of self contained gates or on the pedestal of non-self contained gates.
b. Stands shall operate the gates under the specified operating head with not greater than a 40-pound pull on the crank or handwheel.
c. Each type shall be provided with a threaded cast manganese bronze lift nut to engage the operating stem.
d. Provide anti-friction bearings to properly support both opening and closing thrusts.
e. All components shall be totally enclosed in a weather-proof housing. Provide positive mechanical seals to exclude moisture and dirt and prevent leakage of lubricant out of the unit.
f. Provide lubricating fittings for all gears and bearings.
g. For self-contained type stainless steel slide gates, the distance between handwheel or crank operator and the operating floor shall be 36-inches minimum and 48-inches maximum.
h. Stands shall include a pedestal designed to position the input shaft approximately 36-inches above the operating floor. An arrow with the word "OPEN" shall be permanently attached or cast on the floorstand indicating the direction of rotation to open the stainless steel slide gate. Manual operators shall turn right to close, unless otherwise specified.
i. Operators shall be furnished with a limit switch to indicate fully closed position, where shown.
j. Provide mechanical stops adjustable ±five degrees at each end of travel.

2. Hand-wheel operators:
   a. Handwheel-operated type shall be without gear reduction.
   b. The handwheel shall be removable and shall have a minimum diameter of 15 inches.
3. Crank-operated operators:
   a. Crank-operated type will have either a single or double gear reduction, as required.
   b. The crank shall be cast aluminum or cast iron with a revolving nylon grip.
   c. The crank shall be removable.
   d. Crank-operated gates shall be provided with nut-operator drives as noted on Stainless Steel Slide Gate Schedule.
4. Where shown on the Contract Drawings, provide 2-inch square nut, mounted in a floor box, with a non-rising stem.
   a. The square nut shall be constructed of bronze.
   b. The floor box shall be constructed of stainless steel or cast iron and shall be set in the concrete floor above the gate as shown.
   c. Provide one aluminum or stainless steel T-handle wrench for operation.

D. Identification: Identify each stainless steel slide gate with a stainless steel nameplate stamped with the approved designation as shown in the Stainless Steel Slide Gate Schedule, located at the end of this Section. Nameplate shall be permanently fastened to the gate at the factory.

2.5 SURFACE PREPARATION AND PAINTING

A. Finish: Mill finish on stainless steel. Welds and weld burn shall be passivated in accordance with ASTM A380. If bead blasting is utilized, the entire frame and entire slide shall be blasted to provide a uniform finish. All iron and steel components shall be properly prepared and shop coated with a primer.

B. Clean, prime coat, and finish coat ferrous metal surfaces of equipment in the shop in accordance with the requirements of Section 09 91 00, Painting.

C. Coat machined, polished and non-ferrous surfaces bearing surfaces and similar unpainted surfaces with corrosion prevention compound, which shall be maintained during storage, and until equipment begins operation.

D. Contractor shall certify, in writing, that the shop primer and coating system conforms to the requirements of Section 09 91 00, Painting.

2.6 SOURCE QUALITY CONTROL

A. Shop Tests:
   1. Test each stainless steel slide gate fully assembled in the vertical position for proper seating.
   2. Fully open and close gate disc in its guide system to ensure that it operates freely.
   3. Operate and test floor stands, bench stands and motor operators to ensure proper assembly and operation.
   4. The seal system shall have been factory tested to confirm negligible wear (less than 0.01”) and proper sealing. The factory testing shall consist of an accelerated wear test comprised of a minimum of 100,000 open-close cycles using a well-agitated sand/water mixture to simulate fluidized grit.

PART 3 – EXECUTION

3.1 EXAMINATION / PREPARATION

A. Inspect and verify that structures or surfaces or pipes on which equipment will be installed have no defects which will adversely affect installation.

B. Inspect all equipment prior to installation.

C. Field verify all existing dimensions and elevations required for slide gate production.

D. Field painting, if required, shall conform to the requirements of Section 09 91 00, Painting.

3.2 INSTALLATION

A. Install stainless steel slide gate equipment in accordance with manufacturer's instructions and recommendations.

B. Brace guides and frames during placement of concrete.

C. Set anchor bolts in accordance with approved Shop Drawings and manufacturer's recommendations.

D. Provide minimum of 1-inch of non-shrink grout below all floorstands.

E. Accurately center floor and bench stands over the gate.

F. Adjust all parts and components as required to provide correct operation.

3.3 FIELD TESTING / QUALITY CONTROL

A. After Contractor and Engineer have mutually agreed that the equipment installation is complete and ready for continuous operation, Contractor and a qualified field service representative of the manufacturer shall conduct a functional field test and a leakage test of each stainless steel slide gate in the presence of Engineer to demonstrate that each stainless steel slide gate furnished will function correctly and that maximum permissible leakage is not exceeded.

B. Field Tests:
   1. Functional Tests:
      a. Each stainless steel slide gate with appurtenances shall be field-tested. Tests shall demonstrate to Engineer that each part and all parts together function in the manner intended. All necessary testing equipment and manpower shall be provided by Contractor at their expense. Owner will furnish all power, and incidental material and labor required for the tests.
      b. Each gate shall be cycled to confirm that they operate without binding, scraping, or distorting.
      c. The effort to open and close the gates shall be measured and shall not exceed the maximum effort specified within this Section.
   2. Leakage Tests:
      a. Maximum permissible leakage shall be in accordance with the requirements of this Section. Excess leakage shall be reduced to meet specified requirements by adjusting the gate, or replacement will be required.
   3. In the event that the manufacturer is unable to demonstrate to Engineer that their equipment meets the requirements of the tests, the deficient equipment will be rejected and Contractor shall adjust and/or modify and retest the equipment as often as necessary to meet the specified requirements. No separate payments shall be made for adjustments and/or modifications.

3.4 MANUFACTURER'S SERVICES

A. Provide a factory-trained representative for visits for the following activities:
   1. Installation Supervision – 1 visit.
   2. Field Testing – 1 visit.
   3. Training – 1 Visit.

B. Each visit shall be a minimum of 8 hours on site, unless otherwise specified.

C. Representative shall revisit the Site as often as necessary until all trouble is corrected and the installation is entirely satisfactory at no additional cost to the Owner.

D. All costs, including travel, lodging, meals and incidentals, for additional visits shall be at no additional cost to the Owner.

E. On completion of Field Testing, the factory-trained representative shall provide the Supplier's Installation Certificate in accordance with Section 01 75 11, Checkout and Startup Procedures.

F. Training: Furnish services of qualified factory trained specialists from manufacturer to instruct Owner's operations and maintenance personnel in recommended operation and maintenance of products. Training requirements, duration of instruction, and other qualifications shall be per Section 01 79 23, Instruction of Operations and Maintenance Personnel.

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STAINLESS STEEL SLIDE GATE SCHEDULE

Location:	**Wet Well (Influent Sewer)**	**Wet Well (Influent Channels)**	**Wet Well (Dividing Wall)**
Equipment Tag(s):	WRS-SG-1	WRS-SG-2 and WRS-SG-3	WRS-SG-4
Quantity:	1	2	1
Opening Shape:	Circular	Rectangular (Channel)	Circular
Opening Size (W x H or DIA.):	12” DIA.	24” x 30”	12” DIA.
Opening Invert Elevation(1):	-6.94’	-7.90’	-12.98
Operating Floor Elevation(1):	19.00’	-4.90’	-4.90’
Design Head from Opening Invert (Seating/Unseating):	20’ / 20’	20’ / 20’	20’ / 20’
Opening Direction:	Upward	Upward	Upward
Frame Type:	Non-self Contained	Self-Contained	Non-self Contained
Mounting Type:	Pipe Flange-Mounted	Channel Mount (Surface)	Pipe Flange-Mounted
Stem Type:	Rising	Rising	Rising
Operator(s):	Manual (Handcrank)	Manual (Handwheel)	Manual (Handcrank)

Notes:

1. Contractor is responsible for field verifying all elevations prior to equipment fabrication.

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SECTION 46 41 23

SUBMERSIBLE MIXERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install submersible mixers complete and operational.
   2. All Work specified under this Section shall be included under Payment Item No. 1

B. Coordination:
   1. Review installation procedures under this and other Sections and coordinate the installation of items that must be installed with, or before the submersible mixers Work.

C. Related Sections:
   1. Section 03 60 00, Grouting.
   2. Section 05 05 33, Anchor Systems.
   3. Section 09 91 00, Painting.

1.2 REFERENCES

A. Standards referenced in this Section are listed below:
   1. American Bearing Manufacturers Association, (ABMA).
   2. American Gear Manufacturers Association, (AGMA).
   3. American Institute of Steel Construction, Inc., (AISC).
      a. AISC 303, Code of Standard Practice for Steel Bridges and Buildings.
      b. AISC S326, Design, Fabrication and Erection of Structural Steel.
   4. American National Standards Institute, (ANSI).
   5. American Society for Testing and Materials, (ASTM).
      a. ASTM A 36/A 36M, Specification for Carbon Structural Steel.
      b. ASTM A 48/A 48M, Specification for Gray Iron Castings.
   6. American Welding Society, (AWS).
      a. AWS D1.1/D1.1M, Structural Welding Code-Steel.
   7. Institute of Electrical and Electronics Engineers, (IEEE).
   8. National Electrical Code, (NEC).
   9. National Electrical Manufacturers Association, (NEMA).

1.3 QUALITY ASSURANCE

A. Manufacturer’s Qualifications:

1. Manufacturer shall have a minimum of ten years experience producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.

B. Component Supply and Compatibility:
   1. Obtain all equipment included in this Section regardless of the component manufacturer from a single submersible mixing manufacturer.
   2. The submersible mixers manufacturer to review and approve or to prepare all Shop Drawings and other submittals for all components furnished under this specification.
   3. All components shall be specifically constructed for the specified service conditions and shall be integrated into the overall assembly by the submersible mixers manufacturer.

1.4 SUBMITTALS

A. Action Submittals: Submit the following:
   1. Shop Drawings:
      a. Manufacturer's literature, data sheets, fabrication, assembly and mounting drawings of the following components showing materials and significant dimensions in sufficient detail to demonstrate compliance with specified requirements.
         1) Propellers:
            a) Diameter.
            b) Tip speed at maximum shaft speed and at the minimum required water horsepower.
            c) Materials of construction.
            d) RPM.
         2) Propeller Shafts:
            a) Diameter.
            b) Materials of construction.
         3) Motor Shop Drawings in accordance with Section 40 05 93, Common Motor Requirements for Process Equipment, including:
            a) Horsepower.
            b) Rpm.
            c) Insulation and enclosure details.
            d) Efficiency at full, 3/4 and 1/2 load.
         5) Electrical Information:
            a) Wiring diagrams showing all electrical connections to the motor.
         6) For all components of submersible mixers as appropriate, including setting drawings and instructions for installation of anchor bolts and gear reducer, including tolerances.

B. Informational Submittals: Submit the following:
   1. Support Design Information:
      a. Weight of the complete assembly.
   2. Source Quality Control Submittals:
      a. Submit results of performance tests and cable insulation tests.
   3. Site Quality Control Submittals:
      a. Submit a written report giving the results of required field tests.
      b. Submit written report of results of each visit by a manufacturer's serviceman, including purpose and time of visit, tasks performed and results obtained.

C. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Manuals:
      a. Submit complete Installation, Operation and Maintenance Manuals, including, test reports, maintenance data and schedules, description of operation, and spare parts information.
      b. Furnish Operation and Maintenance Manuals in conformance with the requirements of Section 01 78 23, Operation and Maintenance Data.
   2. Warranty Documentation:
      a. Manufacturer’s Standard Warranty.

D. Maintenance Material Submittals: Furnish the following:
   1. Spare Parts:
      a. Furnish all required spare parts as specified in Part 2 of this specification.
   2. Tools:
      a. Furnish all required special tools as specified in Part 2 of this specification.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading:
   1. Deliver materials to the Site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time to prevent delay of that Work.
   2. Comply with Section 01 65 00, Product Delivery Requirements.

B. Storage and Protection:
   1. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
   2. Comply with Section 01 66 00, Product Storage and Handling Requirements.

C. Acceptance at Site:
   1. All boxes, crates and packages shall be inspected by CONTRACTOR upon delivery to the Site. CONTRACTOR shall notify ENGINEER, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.6 WARRANTY

A. Provide the manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS

A. Description:
   1. Mixer shall be of the close-coupled, submersible type. Units shall be capable of keeping solids in suspension and mixing waste material of the type and with the consistency given in the Schedule of Service Conditions. Mixer shall be capable of continuous operation with the mixer blade both partially or completely submerged and capable of continuous operation for two hours with all components completely unsubmerged. Mixer shall be able to be raised and lowered and shall be easily removed for inspection or service without the need for personnel to enter the tank.

B. Performance Criteria:
   1. Schedule of Service Conditions:
      a. Location: Weaver Street Pumping Station.
      b. Designation: MX-1 and MX-2.
      c. Total Number of Units: 2.
      d. Motor Horsepower: 1.5 HP.
      e. Propeller Diameter: 580 mm.
      f. Propeller Speed (Maximum): 800 rpm.
      g. Type of Waste: Sanitary Wastewater.
      h. Minimum Volume Mixed: 320 cubic feet
      i. Maximum Volume Mixed: 640 cubic feet

2.2 MANUFACTURERS

A. Manufacturers: Provide equipment of one of the following:
   1. Xylem/Flygt – 4200 Series.
   2. Or equal.

2.3 DETAILS OF CONSTRUCTION

A. Propellers:
   1. Material: Type 316 stainless steel
   2. Type: Three-bladed propeller, dynamically balanced, single non-clogging backward curved design.
   3. Propeller shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in sewage and septage.
   4. Fit between the propeller and the shaft shall be a sliding fit employing an expansion sleeve with torque screws for securing the propeller to the shaft.

B. Propeller Shafts:
   1. Provide single unit propeller shaft and motor shaft.
   2. Material: ASTM/ANSI 431 stainless steel.

C. Bearings:
   1. Motor shaft shall rotate on two permanently lubricated bearings. Support bearing shall be a single row deep groove ball bearing and main bearing a two-row angular contact ball bearing or a single row deep groove ball bearing.

D. Mechanical Seals:
   1. Provide mixer with a liquid chamber for the shaft sealing system.
   2. Provide each mixer with a dual mechanical shaft seal system consisting of two independent seals assembled into one plug-in unit. The seals shall require neither maintenance nor adjustment.
   3. Outer seal shall have rings constructed of corrosion resistant cemented carbide or silicon carbide.

G. Motor:
   1. Motors shall be a squirrel cage induction, shell type design, housed in an air-filled, watertight chamber suitable for NEC Class I, Division 1 applications. Motors shall include the protective devices described in Paragraph 2.3.H., below.
   2. Motors shall be rated 1.5 HP suitable for operation on a 208 volt, 3 phase 60 Hz supply.
   3. Provide premium efficient motors in accordance with Class IE4 levels.
   4. Provide motor of proper size to drive the mixer continuously at any point on the mixer operating curve without exceeding nameplate horsepower, but not less than the horsepower shown in Schedule of Service Conditions.
   5. Motors shall have a 1.15 service factor, and shall comply with the latest ANSI, NEMA, ABMA and IEEE Standards as a minimum.
   6. Locked rotor current shall be as specified in NEMA standards.
   7. Motor thrust bearings shall be adequate to carry continuous thrust loads under all conditions of service, and shall have a minimum B-10 life of 30,000 hours.
   8. Motors shall have a stainless steel nameplate which shall provide the following: type, frame, insulation, class, Hp, full load current, RPM, centigrade degree rise, manufacturer's name and serial number, model number, voltage, locked rotor KVA code, bearing numbers and a connection diagram.
   9. Cable entry water seal design shall not require specific torque to ensure a watertight and submersible seal. Cable entry shall be comprised of a single cylinder elastomer grommet, flanked by washer, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function, separate from the function of sealing the cable. Assembly shall bear against a shoulder in mixer top.
   10. Junction chamber and motor compartment shall be separated by a terminal board which shall protect the motor interior from foreign material gaining access through the mixer top. Connection between the cable conductors and stator leads shall be made with threaded compressed type binding posts

permanently affixed to the terminal board. Epoxies, silicones, or other secondary sealing systems are not acceptable.

H. Protective Devices:
   1. Provide thermal sensors to monitor stator temperatures. Furnish stator with three thermal switches, embedded in the end coils of the stator winding (one which in each stator phase). Thermal switches shall be used in conjunction with, and supplemented to, external motor overcurrent protection. Thermal switches shall be normally-closed and wired in series.
   2. Provide a moisture detection control consisting of a motor embedded sensor probe and test resistor and induction relay. Relay shall be suitable for 120 volt operation and shall include a test switch and lamp and two normally open and one normally closed dry load contacts. Mount relay in the motor junction terminal box.
   3. Switch wire leads shall exit the motor casing along with the motor cable and be properly sealed for a submersible application.
   4. Switch contacts shall be rated 10 amps at 120 VAC, minimum.
   5. Pre-assemble and terminate motor lead and protective switch cables inside a NEMA 4X junction terminal box. Properly size box for installation of the moisture relay. Provide sufficient cable so that junction terminal box can be mounted at least four feet above the operating floor level.

I. Power Cable:
   1. Provide submersible hypalon jacketed, Type SPC cable (power plus ground plus control), UL listed and labeled. No splices will be allowed in the cable.
   2. Size conductors in accordance with IEC Standards.
   3. The cable entry shall be positioned on the top of the mixer to avoid a bend on the motor cable when routed to the top of the tank.

J. Guide Rail and Mounting Details:
   1. Provide a non-sparking guide rail arrangement compatible with NEC Class I, Division 1. Guide rail shall permit the mixer to be positioned at any level in the tank and flows directed in a 180 arc.
   2. Guide rail arrangements shall consist of a 4-inch square vertical guide bar, base plate with guide pin, guide bracket, cable holder, lifting cable, handle, mounting brackets and sway brace stands.
   3. Guide bar shall be designed to support the installation of a hoist assembly for removal of the mixer.
   4. Provide hoist assembly with a 1,500 pound hand operated winch. Winch shall be a worm gear, self locking type, with cut steel gears and suitable for outdoor installation.
   5. Provide the “Grip Eye” lifting system by Flygt Corporation, or equal, for lifting mixers. All chain, cable and fittings shall be of Type 316 stainless steel.

2.4 ANCHOR BOLTS

A. Furnish anchor bolts and nuts of ample size and strength for the purpose intended, sized by the equipment manufacturer. Provide hooked anchor bolts for direct

embedment during placement of concrete. Anchor bolt material shall be Type 316 stainless steel conforming to the requirements of Section 05 05 33, Anchor Systems.

2.5 TOOLS AND SPARE PARTS

A. Furnish and deliver the following boxed and labeled:
   1. The following required spare parts are based on Flygt submersible mixers. Furnish comparable spare parts if mixers provided by another manufacturer.
   2. Each mixer shall be furnished with the following spare parts and tools.
      a. Eight grommets.
      b. Four O-rings of each size required by unit.
      c. Two motor shaft lip seals.
      d. Two rotor locking screws.
      e. Two shaft nuts.
      f. One driven gears.
      g. Six expansion sleeves.
      h. Two hex head propeller bolts.
      i. Two plastic propeller caps.
      j. Two sets of any special tools required for normal operation and maintenance.

B. Spare parts shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location until transferred to the OWNER at the conclusion of the Project.

C. Manufacturer shall furnish a list of additional recommended spare parts for an operating period of one year. The list shall describe each part, the quantity recommended, and the unit price of the part.

2.6 SURFACE PREPARATION AND PAINTING

A. Mixers, motors, frames, ferrous metal surfaces, appurtenances, etc., shall receive shop primer coating conforming to the requirements of Section 09 91 00, Painting.

B. Surface preparation and painting shall conform to the requirements of Section 09 91 00, Painting.

C. All gears, bearing surfaces, machined surfaces and other surfaces which are to remain unpainted shall receive a heavy application of grease or other rust-resistant coating. This coating shall be maintained during storage and until the equipment is placed into operation.

D. CONTRACTOR shall certify, in writing, that the shop primer and finish coating system conforms to the requirements of Section 09 91 00, Painting.

2.7 LUBRICANTS

A. Furnish all oil and grease required for initial operation. Use products as recommended by the manufacturer.

2.8 SOURCE QUALITY CONTROL

A. Shop Tests:
   1. Perform a motor and cable insulation test for moisture content or insulation defects.
   2. Prior to submergence, run the unit dry to establish correct rotation and mechanical integrity.
   3. Prior to submergence, perform a tightness test of the assembled mixer using a vacuum method.
   3. Run the mixer for 30 minutes submerged.
   4. After initial operating test, stop motor and wait 30 minutes while still submerged, then perform the insulation test again with the motor still submerged.
   5. Each test shall be witnessed by a Registered Professional Engineer, who may be an employee of the manufacturer. The Registered Professional Engineer shall sign and seal the required tests were performed. The test results shall show the serial numbers of all equipment tested.

PART 3 - EXECUTION

3.1 EXAMINATION / PREPARATION

A. Inspect and verify that structures or surfaces on which equipment will be installed have no defects which will adversely affect installation.

B. Inspect all equipment prior to installation

C. Promptly report defects which may affect Work to ENGINEER.

3.2 INSTALLATION

A. Install in a manner and to the tolerances recommended by the equipment manufacturer and approved Shop Drawings.

B. Manufacturer's representative shall check and approve the installation prior to operation. Manufacturer's representative shall field test and calibrate the equipment to assure that the system operates to the OWNER'S satisfaction.

3.3 FIELD TESTING / QUALITY CONTROL

A. All equipment will be given running tests by CONTRACTOR at the job Site following installation of the equipment and controls. Should the tests indicate any malfunction, CONTRACTOR shall make any necessary repairs and adjustments.

Such tests and adjustments shall be repeated until, in the opinion of the ENGINEER, the installation is complete and the equipment is functioning properly and accurately, and is ready for permanent operation.

B. Field testing shall be performed in the presence of the ENGINEER and manufacturer's representative.

C. CONTRACTOR shall provide a minimum of 14 days notice prior to performing field testing.

D. Field Tests:
   1. Field test equipment and its controls in local mode, followed by demonstrating proper operation and controls in automatic mode.
   2. Perform operating tests to demonstrate that the equipment operates without excessive vibration.
   3. Perform mixing tests to demonstrate that the contents of each wet well are thoroughly mixed and that mixer is capable of continuous operation at completely unsubmerged conditions for not less than two hours.
   3. Make adjustments required to place equipment in proper operating condition.

3.4 SERVICES OF MANUFACTURER'S REPRESENTATIVE

A. Provide a factory-trained representative for visits for the following activities:
   1. Installation Supervision – 1 visit.
   2. Field Testing – 2 visits.
   3. Start-Up – 1 visit.
   4. Training – 1 Visit.

B. Each visit shall be a minimum of 8 hours on site, unless otherwise specified.

C. Representative shall revisit the Site as often as necessary until all trouble is corrected and the installation and operation are entirely satisfactory at no additional cost to the OWNER. All costs, including travel, lodging, meals and incidentals, for additional visits shall be at no additional cost to the OWNER.

D. The factory-trained representative shall provide the Supplier's Installation Certificate in accordance with Section 01 75 11, Checkout and Startup Procedures.

E. Training: Furnish services of qualified factory trained specialists from manufacturer to instruct Owner's operations and maintenance personnel in recommended operation and maintenance of products. Training requirements, duration of instruction, and other qualifications shall be per Section 01 79 23, Instruction of Operations and Maintenance Personnel.

+ + END OF SECTION + +

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Exhibit A

Hazardous Materials Inventory Report for the Fenimore Road, Weaver Street, Archville, and Country Club Lane Pumping Stations

Hazardous Materials Inventory Report for the Fenimore Road, Weaver Street, Archville and Country Club Lane Pumping Stations

Prepared by:

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August 2020

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Attachment B Hazardous Materials Photo Log
Attachment C Bidwell Environmental LLC Asbestos Handling License and Certifications
Attachment D Mandell Lead Inspectors, Inc. Lead Paint Inspection Report and Certificate

1. Introduction

Bidwell Environmental (Bidwell) was retained by Arcadis to perform a hazardous materials assessment (hazards assessment) at four Westchester County Pumping Stations: Weaver Street (Cargil Park Road, Mamaroneck, NY 10538), Fenimore Road (812 Fenimore Road, Larchmont, NY 10538), Archville (Arch Hill, Briarcliff Manor, NY 10510) and Country Club Lane (Country Club Lane South, Briarcliff Manor, NY 10510). The work described herein was performed in support of design contract Pumping Station Rehabilitation and includes sampling and analysis of accessible suspect hazardous materials on equipment and substrates set to be impacted by future construction. The hazards assessment was initiated in July 2020. The scope of work under the Pumping Station Rehabilitation is to completely renovate each of the four pump stations. All investigation activities were led by Bidwell. The lead paint survey was provided by Mandell Lead Inspectors, Inc. (NY/EPA Certification No. LBP-R-5686-1). Laboratory services were subcontracted to:

- Aqua Pro-Tech Laboratories (APL) (New York State Environmental Laboratory Approval Program [NYS ELAP] Certification No. 11634, as provided in Attachment A);
- Niche Analysis, Inc. (NYS ELAP Certification No. 11236, as provided in Attachment A); and
- KAM Consultants (NYS ELAP Certification No. 11273, as provided in Attachment A).

The results of all investigation activities are presented in this Hazardous Materials Inventory Report. This report includes a detailed discussion of the background investigation, scope of work, findings, and recommendations for known hazardous materials and items requiring further investigation (Section 2 through 6). The discussion presented herein is supported by Tables 1-6, Figures 1-5, and Attachments A-D as referenced throughout the document.

2. Background Investigation

In support of the field effort, Bidwell performed a background investigation consisting of an existing data review and staff interviews. The only relevant information provided was that the force main at the Fenimore Road Pump Station is asbestos-cement.

3. Scope of Work

3.1 Asbestos Survey

A bulk asbestos survey was performed by a New York State Department of Labor (NYSDOL)-certified Asbestos Inspector to identify, assess, and quantify asbestos-containing materials (ACM) within areas affected by the proposed scope of work. The survey was performed in accordance with the EPA's "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). Field information was generally organized following the AHERA concept of a homogenous area. That is, suspect ACM with similar age, appearance, and texture was grouped together for the purpose of collecting a representative sample. Bulk sampling involved penetrating the total depth of the suspect material, thereby providing a core of all materials present. Representative sampling was based upon the material's physical characteristics and distribution throughout the survey area.

Analysis of the samples collected during the survey included Polarized Light Microscopy (PLM) and Transmission Electron Microscopy (TEM). PLM is the recommended method (NYS ELAP Protocol 198.1, June 2016) for determining the presence of asbestos in building and equipment materials. These materials include, but are not limited to caulk, mortar, tar and gaskets. The PLM procedures involve taking a small amount of the suspect material during sample collection and isolating the fibers present in a certified laboratory and identifying them based on the crystalline properties observed. All asbestos types are crystalline materials and as a result can be identified by specific optical properties observed in the polarized light microscope. Results of the analysis are reported as a percentage of the total sample. The PLM method has a detection limit of 1%.

Non-friable, organically bound material was considered positive until proven negative by TEM using NYS ELAP Protocols 198.4/198.6 (June 2016). TEM represents the most sophisticated technology available for determining the presence of asbestos fibers in the finest size ranges and has the ability to definitively identify these fibers by Energy Dispersive X-ray microanalysis and Selected Area Electron Diffraction. The TEM method has a detection limit of 1%.

The results of PLM and TEM analysis are discussed in Section 4.1 and summarized in Table 1. Asbestos-containing materials are highlighted in bold in Table 1. Quantities of asbestos-containing materials are provided in Table 2. Asbestos sample locations are depicted in Figures 1 through 5. The complete laboratory data packages are provided within Attachment A. Photographs of confirmed ACM are provided in Attachment B. Bidwell asbestos certificates are provided within Attachment C.

3.2 Lead and PCBs in Paint

Historically, lead and PCBs were used in paints for several reasons. Lead was used as pigment because it made colors more vibrant. Lead was also used as a preservative, because it made the paint more weather resistant, resisted the growth of mold and mildew, and helped prevent corrosion of metal surfaces. PCBs were used in paint formulations to improve water and chemical resistance, elasticity, and durability.

3.2.1 Lead Paint Survey

An X-Ray Fluorescence (XRF) survey was conducted by a certified professional to identify potential lead-containing paints throughout each pump station. The XRF survey was performed in accordance with HUD Guidelines (1997 revisions) using "XRF" technology to screen for lead. During the survey, sampling of selected areas was performed using a Hueresis Pb 2000i Lead-Based Paint Analyzer operated in accordance with the procedures in the EPA/HUD Performance Characteristic Sheets and by correcting for substrates, where recommended. The area tested for targeted substrates was representative of the overall thickness of the suspect paint. Multiple representative XRF samples were taken on all painted components (from each distinguishable color) in order to evaluate variations in lead concentration within like paints. Readings were collected for representative painted surfaces which were visible to the inspector at the time of the inspection and accessible without the use of specialized equipment.

The results of the XRF survey are discussed in Section 4.2 and summarized in Table 3. XRF sample locations are depicted in Figures 1 through 5. A copy of the complete survey report is provided in Attachment D.

3.2.2 PCB Paint Chip Sampling

As the pump stations were recently renovated in the 1990s, PCB analysis was only performed on paints that were believed to have been present prior to the renovation (determined by appearance, age of equipment, condition etc.). PCB analysis was performed by APL using Environmental Protection Agency's (EPA) method SW 846-8082A (soxhlet extraction). Analytical results are discussed in Section 4.2 and summarized in Table 4. Photographs of PCB-containing paints are provided in Attachment B. Paint chip sample locations for this investigation are depicted in Figure 3. The complete laboratory data package is provided within Attachment A.

3.3 Other Regulated Wastes

The survey for universal waste and other miscellaneous regulated materials included a visual inspection of suspect materials that may be affected by the construction scope of work. Fluorescent, mercury vapor, High Intensity Discharge (HID) bulbs, and all other non-incandescent bulbs are assumed to be mercury-containing universal wastes and quantified accordingly. Ballasts are assumed to be PCB-containing unless otherwise documented via labeling. Non-PCB ballasts typically contain di (2-ethylhexyl) phthalate and are regulated solid wastes.

Other potentially regulated wastes include mercury-containing equipment (e.g., pressure control switches, thermometers, gauges, etc.), batteries, abandoned chemicals, treated wood, m miscellaneous lead-containing materials, mold, chlorofluorocarbons, electronic components, and low-level radioactive substances. The results of the survey of miscellaneous regulated materials are discussed in Section 4.3 and presented in Table 5.

4. Findings

4.1 Asbestos-Containing Materials

As presented in Table 1, asbestos was detected in black roof mastic, grey conduit wall penetration putty and a grey fibrous gasket at the Fenimore Road Pump Station. Additionally, the 10" force main at the Fenimore Road Pump Station has previously been identified as being made of asbestos-cement. ACM is defined as containing greater than 1% asbestos. The estimated quantity and condition of the identified ACM is provided in Table 2. Trace asbestos (<1%) was identified in putty on roof vent seams at the Weaver Street Pump Station.

4.2 Lead and PCBs in Paint

As summarized in Table 3, lead was detected in paints throughout each of the four pump stations, including but not limited to paint on piping, pumps, control panels, walls and generators. Detectable concentrations measured by XRF ranged from 0.1 to 6 mg/cm^2. Detected concentrations of 1 mg/cm^2 and higher meet the US HUD definition of lead-based paint. However, regardless of the defining criteria for lead-based paints, any detectable concentration of lead may create lead-containing dusts or fumes if the paint is disturbed during future construction activity.

As summarized in Table 4, PCBs were detected in both of the paint samples collected as part of the hazards assessment (1.75 and 18.5 mg/kg). The regulatory limit for defining Toxic Substances Control Act (TSCA)-regulated PCBs is 50 mg/kg.

4.3 Other Regulated Wastes

As summarized in Table 5, the construction scope of work includes the removal of other regulated wastes, including lighting bulbs, lighting ballasts, batteries, circuit boards and a fire extinguisher.

5. Recommendations for Known Hazardous Materials

As detailed in Section 4, the hazards assessment confirmed the presence of hazardous materials that will require special handling during future construction. Remedial action and engineering controls will need to be implemented to provide for the safe handling of materials, and to protect site workers and the surrounding environment. The scope of remedial action shall include spot removal of lead and PCB-containing paints as necessary to control emissions during construction activities; abatement of asbestos-containing materials; and removal of regulated waste by an appropriately licensed waste hauler. Detailed recommendations for handling the known hazardous materials are discussed herein.

5.1 Asbestos-Containing Materials

ACM is defined as containing greater than 1% asbestos. As presented in Table 1, asbestos was identified in mastic, putty, gasket and piping to be impacted by the project scope of work. ACM affected by construction (e.g., on equipment targeted for demolition) must be removed by a NYS DOL-licensed asbestos abatement contractor. Specific means and methods for the asbestos abatement should be developed by a licensed asbestos project designer. Unless otherwise specifically exempt by the regulations, independent third-party air monitoring must be performed by a NYSDOL-certified Asbestos Air Sampling Technician or Asbestos Project Monitor, prior to, during, and at the conclusion of all abatement activities, to protect the health and welfare of the public and site personnel.

According to NYSDEC, non-friable ACM can be disposed of in a construction and demolition debris landfill. All friable ACM, however, must be disposed of in a municipal waste landfill permitted to accept asbestos-containing wastes by EPA, as well as state, and local authorities. NYSDEC regulations pertaining to ACM are found in 6 NYCRR 360, Solid Waste Management Facilities.

Occupational asbestos exposure during construction/demolition activities is regulated by OSHA's Asbestos Standard for the Construction Industry (29 CFR 1926.1101). Work covered under the OSHA standard includes, but is not limited to:

- Demolition or salvage of structures where ACM is present;
- Removal or encapsulation of ACM;
- New construction, alteration, repair or renovation of structures, substrates, or portions thereof that contain ACM; and
- Transportation, disposal, storage, or containment of ACM on the site or location at which construction activities are performed.

The OSHA PEL for worker exposures to airborne asbestos fiber concentrations is 0.1 fibers per cubic centimeter (f/cc) of air as an 8-hour TWA. The corresponding Excursion Limit is 1.0 f/cc averaged over a 30-minute period. At or above these limits, employers are required to follow all of the requirements set forth in 29 CFR 1926.1101. The contractor will be responsible for following the requirements of all federal, state, and local regulations during any abatement or construction/demolition activities conducted at the site.

All workers engaged in asbestos abatement shall follow task-specific health and safety protocols.

In addition to the above noted materials containing greater than 1% asbestos, trace asbestos was found in putty (roof vent seams at Weaver Street Pump Station) identified in Table 1. While the removal of materials containing trace levels of asbestos is not regulated, it is recommended that the work be performed in accordance with minimum safe work practices.

5.2 Lead and PCB-Containing Materials

As presented in Table 4, PCBs were detected in two paints at the Fenimore Road Pump Station. The regulatory limit for defining Toxic Substances Control Act (TSCA)-regulated PCBs is 50 mg/kg. All workers engaged in disturbing/handling PCB-containing paints shall follow task-specific health and safety protocols.

As presented in Table 3, areas affected by the scope of work were determined to have lead-based and lead-containing paints. According to 40 CFR 745.223, lead-based paint (LBP) is defined as paint that contains greater than or equal to 1 mg/cm^2. Lead-containing paint (LCP) is paint that contains less than 1 mg/cm^2 of lead.

Since both LBP and LCP are subject to the requirements set forth in the OSHA Lead in Construction Standard (29 CFR 1926.62), the results of the LBP/LCP inspection can be used to determine where construction/demolition activities will require compliance with the standard, and are also pertinent to the selection of an appropriate disposal site and/or recycling facility for demolition debris containing lead-painted surfaces.

Construction areas impacting lead and PCB-containing materials should be posted as lead and PCB work areas, as applicable. Plastic sheeting should be used to protect the floors and equipment within the work areas. Cutting via hot methods should be avoided as practical, even after paint has been removed. Lead and PCB awareness training should be provided to all workers and inspectors, and exposure and area monitoring should be conducted during all activities that have the potential to generate dusts or fumes.

The disposal of materials coated with LBP or LCP must be conducted in accordance with any applicable state and federal regulations, including RCRA regulations. Items that are not recycled (e.g., non-metallic wastes) would be subject to RCRA regulations. Under RCRA, lead-contaminated waste is regulated as a hazardous waste if the TCLP result exceeds 5.0 milligrams per liter (mg/L).

Wastes intended for recycling (e.g., painted scrap metal) are exempt from the definition of solid/hazardous waste under RCRA and New York State Department of Environmental Conservation (NYSDEC) regulations (6 NYCRR 371.1(c)(7)). Specifically, painted scrap metal shall be recycled in accordance with a C7 notification filed with the NYSDEC. Operators of the recycling facilities must be notified of the presence of lead paint on wastes to be recycled in order to ensure proper handling.

Occupational lead exposure during construction activities is regulated by OSHA's Lead in Construction Standard, 29 CFR 1926.62. Work covered under the OSHA standard includes, but is not limited to:

- Demolition or salvage of structures where lead or materials containing lead are present;
- Removal or encapsulation of materials containing lead;
- New construction, alteration, repair or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead; and
- Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed.

The OSHA PEL for worker exposures to airborne lead concentrations is 50 micrograms per cubic meter of air (µg/m^3) as an 8-hour TWA. The OSHA Action Level is 30 µg/m^3. At or above these limits, employers are required to follow all of the requirements set forth in 29 CFR 1926.62. Various levels of potential employee exposure while performing specific work tasks are listed in the standard along with guidance regarding corresponding personnel protective equipment (PPE) (e.g., respirators), air monitoring, and medical surveillance requirements. The contractor will be responsible for following the requirements of the standard during work to be conducted at the Site.

5.3 Other Regulated Wastes

As summarized in Table 5, the pump stations were determined to contain universal and other regulated materials. Universal waste bulbs must be recycled at an appropriately permitted facility. Non-PCB ballasts shall be managed as non-hazardous regulated waste at an appropriately permitted facility. Disposal of PCBs shall be at a TSCA-permitted facility. Electronic components are considered hazardous and must be recycled at a registered electronic waste recycling facility.

Fire extinguishers require special handling and must be recycled or disposed, as appropriate, by a local fire extinguisher retailer.

6. Items Requiring Further Investigation

In addition to the confirmed hazardous materials, there were a number of areas at each pump station that could not be inspected during the survey as shown on Table 6. Materials within these areas are presumed hazardous (lead-based, TSCA-regulated, ACM as appropriate) until proven otherwise. Presumed hazardous materials discovered during construction/demolition activities should be sampled by a an appropriately qualified Inspector and sent to an accredited laboratory for analysis, unless otherwise managed as hazardous.

Table 1
Summary of Asbestos Analysis
Hazardous Materials Inventory Report
Pumping Station Rehabilitation

Sample ID	*HMG*	*Pumping Station*	*Area*	*Sample Location*	*Material Description*	*Analytical Results (%)*		
						PLM	PLM-NOB	TEM
WV-ASB-01	1	Weaver Street	Exterior	Roof vent seams	Grey putty	NA	ND	<1
WV-ASB-02	1	Weaver Street	Exterior	Roof vent seams	Grey putty	NA	ND	<1
WV-ASB-03	2	Weaver Street	Exterior	Gate valve operator	White gasket	NA	ND	ND
WV-ASB-04	2	Weaver Street	Exterior	Gate valve operator	White gasket	NA	ND	ND
WV-ASB-05	3	Weaver Street	Dry Well, Upper Floor	Fan panel conduit penetration	Grey putty	NA	ND	ND
WV-ASB-06	3	Weaver Street	Dry Well, Upper Floor	Fan panel conduit penetration	Grey putty	NA	ND	ND
WV-ASB-07	4	Weaver Street	Dry Well, Upper Floor	Conduit wall penetration	Grey concrete	ND	NA	NA
WV-ASB-08	4	Weaver Street	Dry Well, Upper Floor	Conduit wall penetration	Grey concrete	ND	NA	NA
WV-ASB-09	5	Weaver Street	Dry Well, Upper Floor	HVAC duct	Grey sealant	NA	ND	ND
WV-ASB-10	5	Weaver Street	Dry Well, Intermediate Floor	HVAC duct	Grey sealant	NA	ND	ND
WV-ASB-11	6	Weaver Street	Dry Well, Intermediate Floor	Sludge piping	Black rubber gasket	NA	ND	ND
WV-ASB-12	6	Weaver Street	Dry Well, Lower Floor	Sludge piping	Black rubber gasket	NA	ND	ND
WV-ASB-13	7	Weaver Street	Dry Well, Lower Floor	Sludge piping	Red rubber gasket	NA	ND	ND
WV-ASB-14	7	Weaver Street	Dry Well, Lower Floor	Sludge piping	Red rubber gasket	NA	ND	ND
FR-ASB-15	8	Fenimore Road	Exterior	Roof vent seams	Black sealant	NA	ND	ND
FR-ASB-16	8	Fenimore Road	Exterior	Roof vent seams	Black sealant	NA	ND	ND
FR-ASB-17	**9**	**Fenimore Road**	**Exterior**	**Roof**	**Black mastic**	**NA**	**3.8**	**NA**
FR-ASB-18	**9**	**Fenimore Road**	**Exterior**	**Roof**	**Black mastic**	**NA**	**NA**	**NA**
FR-ASB-19	**10**	**Fenimore Road**	**Dry Well**	**Conduit wall penetration**	**Grey putty**	**NA**	**2.1**	**NA**
FR-ASB-20	**10**	**Fenimore Road**	**Dry Well**	**Conduit wall penetration**	**Grey putty**	**NA**	**NA**	**NA**
FR-ASB-21	11	Fenimore Road	Dry Well	Sludge piping	Red rubber gasket	NA	ND	ND
FR-ASB-22	11	Fenimore Road	Dry Well	Sludge piping	Red rubber gasket	NA	ND	ND
FR-ASB-23	12	Fenimore Road	Dry Well	Sludge piping patch	Black rubber gasket	NA	ND	ND

Table 1
Summary of Asbestos Analysis
Hazardous Materials Inventory Report
Pumping Station Rehabilitation

Sample ID	*HMG*	*Pumping Station*	*Area*	*Sample Location*	*Material Description*	*Analytical Results (%)*		
						PLM	PLM-NOB	TEM
FR-ASB-24	12	Fenimore Road	Dry Well	Sludge piping patch	Black rubber gasket	NA	ND	ND
FR-ASB-25	13	Fenimore Road	Dry Well	Grey sludge pump	White gasket	NA	ND	ND
FR-ASB-26	13	Fenimore Road	Dry Well	Grey sludge pump	White gasket	NA	ND	ND
FR-ASB-27	14	Fenimore Road	Dry Well	Wall sludge pipe penetration	Grey packing	NA	ND	ND
FR-ASB-28	14	Fenimore Road	Dry Well	Wall sludge pipe penetration	Grey packing	NA	ND	ND
FR-ASB-29	**15**	**Fenimore Road**	**Dry Well**	**Blue sludge pump**	**Grey fibrous gasket**	**80**	**NA**	**NA**
FR-ASB-30	**15**	**Fenimore Road**	**Dry Well**	**Blue sludge pump**	**Grey fibrous gasket**	**NA**	**NA**	**NA**
FR-ASB-31	16	Fenimore Road	Dry Well	HVAC duct	Grey sealant	NA	ND	ND
FR-ASB-32	16	Fenimore Road	Dry Well	HVAC duct	Grey sealant	NA	ND	ND
AR-ASB-33	17	Archville	Exterior	Generator	Black foam gasket	NA	ND	ND
AR-ASB-34	17	Archville	Exterior	Generator	Black foam gasket	NA	ND	ND
AR-ASB-35	18	Archville	Exterior	Roof vent seam	Grey sealant	NA	ND	ND
AR-ASB-36	18	Archville	Exterior	Roof vent seam	Grey sealant	NA	ND	ND
CCL-ASB-37	19	Country Club Lane	Electrical panel	Conduit penetration	Grey putty	NA	ND	ND
CCL-ASB-38	19	Country Club Lane	Electrical panel	Conduit penetration	Grey putty	NA	ND	ND

Notes:
(1) Samples collected by Bidwell Environmental in July 2020.
(2) Materials containing more than 1% asbestos are considered asbestos-containing materials. Items in bold are asbestos-containing materials.
HMG - Homogenous Materials Group
ND - Not Detected
NA - Not Analyzed

Table 2
Estimated Quantities and Condition of Known Asbestos-Containing Materials
Hazardous Materials Inventory Report
Pumping Station Rehabilitation

Material Description	*Pumping Station*	*Location*	*Estimated Quantity*	*Condition*	*Friability*
Black mastic on roof	Fenimore Road	Exterior, Roof	150 ft^2*	Damaged	Non-friable
Grey putty around conduit wall penetrations	Fenimore Road	Dry Well	8 ft^2 on multiple penetrations	Damaged	Non-friable
Grey fibrous gasket in blue pump	Fenimore Road	Dry Well	4 ft^2	Good	Non-friable
10" asbestos-cement piping	Fenimore Road	Below grade	15 linear ft.*	Unknown	Unknown

Notes.
* - Quantity of material being disturbed was provided by Arcadis.

Table 3
Summary of XRF Lead Analysis on Paints
Hazardous Materials Inventory Report
Pumping Station Rehabilitation

Sample ID	Pumping Station	Area	Sample Description	Substrate	Condition	Color	Result (mg/cm^2)
7	Weaver Street	Exterior	Generator support	Metal	Deteriorated	Brown	0.2
8	Weaver Street	Exterior	Generator cover	Metal	Deteriorated	Brown	-0.1
9	Weaver Street	Exterior	Valve	Metal	Deteriorated	Grey	0.2
10	Weaver Street	Exterior	Hood	Metal	Deteriorated	Grey	0.1
11	Weaver Street	Exterior	Hood	Metal	Deteriorated	Grey	0.1
12	Weaver Street	Exterior	Door hatch	Metal	Deteriorated	Grey	0.1
13	Weaver Street	Exterior	Generator	Metal	Deteriorated	Green	0.1
14	Weaver Street	Exterior	Floor	Concrete	Deteriorated	Grey	0.1
15	Weaver Street	Exterior	Pipe	Metal	Deteriorated	Black	0
16	Weaver Street	Dry Well, Upper Floor	Stair stringer	Metal	Intact	Blue	0.1
17	Weaver Street	Dry Well, Upper Floor	Stair stringer	Metal	Intact	Blue	0.2
18	Weaver Street	Dry Well, Upper Floor	Pipe	Metal	Deteriorated	Red	0.2
19	Weaver Street	Dry Well, Upper Floor	Pipe	Metal	Deteriorated	Grey	0
20	Weaver Street	Dry Well, Upper Floor	Electric panel	Metal	Intact	Grey	0
21	Weaver Street	Dry Well, Upper Floor	Control panel	Metal	Intact	Grey	0.1
22	Weaver Street	Dry Well, Upper Floor	Control panel	Metal	Intact	Grey	0
23	Weaver Street	Dry Well, Upper Floor	Heater	Metal	Intact	Tan	0
24	Weaver Street	Dry Well, Upper Floor	Motor	Metal	Intact	Green	0.1
25	Weaver Street	Dry Well, Intermediate Floor	Beam	Metal	Deteriorated	Blue	0.1
26	Weaver Street	Dry Well, Intermediate Floor	Beam	Metal	Deteriorated	Blue	0.1
27	Weaver Street	Dry Well, Intermediate Floor	Pipe	Metal	Deteriorated	Grey	0.3
28	Weaver Street	Dry Well, Intermediate Floor	Valve	Metal	Deteriorated	Grey	0.1
29	Weaver Street	Dry Well, Intermediate Floor	Pump	Metal	Intact	Black	0.3
30	Weaver Street	Dry Well, Lower Floor	Pump	Metal	Intact	Black	0.1
31	Weaver Street	Dry Well, Lower Floor	Pump base	Metal	Intact	Black	0.2
32	Weaver Street	Dry Well, Lower Floor	Disconnect switch	Metal	Intact	Grey	0
33	Weaver Street	Dry Well, Lower Floor	Valve wheel	Metal	Intact	Blue	0.1
34	Weaver Street	Dry Well, Lower Floor	Valve	Metal	Intact	Blue	0

Table 3
Summary of XRF Lead Analysis on Paints
Hazardous Materials Inventory Report
Pumping Station Rehabilitation

Sample ID	Pumping Station	Area	Sample Description	Substrate	Condition	Color	Result (mg/cm^2)
35	Weaver Street	Exterior	Disconnect switch	Metal	Intact	Grey	0.1
36	Weaver Street	Exterior	Compressor	Metal	Intact	Green	0.1
49	Fenimore Road	Exterior	Fence	Metal	Intact	Black	0.1
50	Fenimore Road	Exterior	Fence	Metal	Intact	Black	0
51	Fenimore Road	Exterior	Fence	Metal	Intact	Black	0.1
52	Fenimore Road	Exterior	Generator support	Metal	Intact	Green	0.2
53	Fenimore Road	Exterior	Generator support	Metal	Intact	Green	0.2
54	Fenimore Road	Exterior	Generator	Metal	Intact	Green	0.1
55	Fenimore Road	Exterior	Pipe	Metal	Deteriorated	Green	1.7
56	Fenimore Road	Exterior	Pipe	Metal	Deteriorated	Green	4.5
57	Fenimore Road	Exterior	Pipe	Metal	Deteriorated	Green	0.9
58	Fenimore Road	Exterior	Pipe	Metal	Deteriorated	Green	6
59	Fenimore Road	Exterior	Vent base	Metal	Deteriorated	Green	0.4
60	Fenimore Road	Exterior	Vent base	Metal	Deteriorated	Green	2.9
61	Fenimore Road	Exterior	Vent base	Metal	Deteriorated	Green	1.9
62	Fenimore Road	Exterior	Valve	Metal	Deteriorated	Green	0.3
63	Fenimore Road	Exterior	Valve base	Concrete	Deteriorated	Green	0.3
64	Fenimore Road	Exterior	Curb	Concrete	Deteriorated	Green	0.2
65	Fenimore Road	Exterior	Bracket	Metal	Deteriorated	Green	1.5
66	Fenimore Road	Exterior	Bracket	Metal	Deteriorated	Green	2.8
67	Fenimore Road	Dry Well, Mezzanine	Pipe	Metal	Intact	Grey	0.1
68	Fenimore Road	Dry Well, Mezzanine	Pipe	Metal	Intact	Grey	0.2
69	Fenimore Road	Dry Well, Mezzanine	Valve	Metal	Intact	Grey	-0.3
70	Fenimore Road	Dry Well, Mezzanine	Railing	Metal	Intact	Grey	1.6
71	Fenimore Road	Dry Well, Mezzanine	Railing	Metal	Intact	Red	1.5
72	Fenimore Road	Dry Well, Mezzanine	Railing	Metal	Intact	Grey	0.9
73	Fenimore Road	Dry Well, Mezzanine	Pipe	Metal	Intact	Red	0.2
74	Fenimore Road	Dry Well, Mezzanine	Pipe	Metal	Intact	Red	0.5

Table 3
Summary of XRF Lead Analysis on Paints
Hazardous Materials Inventory Report
Pumping Station Rehabilitation

Sample ID	Pumping Station	Area	Sample Description	Substrate	Condition	Color	Result (mg/cm^2)
75	Fenimore Road	Dry Well, Mezzanine	Electric panel	Metal	Intact	Grey	0
76	Fenimore Road	Dry Well, Mezzanine	Control panel	Metal	Intact	Grey	0.1
77	Fenimore Road	Dry Well, Mezzanine	Beam	Concrete	Intact	Grey	0.2
78	Fenimore Road	Dry Well, Mezzanine	Beam	Concrete	Intact	Grey	0.2
79	Fenimore Road	Dry Well, Mezzanine	Beam	Concrete	Intact	Grey	0.2
80	Fenimore Road	Dry Well, Mezzanine	Valve wheel	Metal	Intact	Black	0
81	Fenimore Road	Dry Well	Pump	Metal	Intact	Blue	0.1
82	Fenimore Road	Dry Well	Pump	Metal	Intact	Blue	0.1
83	Fenimore Road	Dry Well	Pump	Metal	Intact	Blue	0.1
84	Fenimore Road	Dry Well	Pump motor	Metal	Intact	Blue	0.1
85	Fenimore Road	Dry Well	Pump motor	Metal	Intact	Blue	0.1
86	Fenimore Road	Dry Well	Pump motor	Metal	Intact	Blue	0.1
87	Fenimore Road	Dry Well	Valve	Metal	Intact	Red	0.4
88	Fenimore Road	Dry Well	Valve	Metal	Intact	Red	-0.1
89	Fenimore Road	Dry Well	Pipe	Metal	Intact	Grey	0.2
90	Fenimore Road	Dry Well	Pipe	Metal	Intact	Grey	-0.9
91	Fenimore Road	Dry Well	Pipe	Metal	Intact	Grey	0.2
92	Fenimore Road	Dry Well	Pump support	Metal	Intact	Grey	0.1
93	Fenimore Road	Dry Well	Pump support	Metal	Intact	Grey	0.1
94	Fenimore Road	Dry Well	Conduit	Metal	Intact	Grey	0.2
95	Fenimore Road	Dry Well, Mezzanine	Conduit	Metal	Intact	Grey	0.4
96	Fenimore Road	Dry Well, Mezzanine	Conduit	Metal	Intact	Grey	0.1
97	Fenimore Road	Exterior	Slab	Concrete	Deteriorated	Black	0.1
98	Fenimore Road	Exterior	Slab	Concrete	Deteriorated	Black	0.1
99	Fenimore Road	Exterior	Slab	Concrete	Deteriorated	Black	0.3
100	Fenimore Road	Exterior	Generator	Metal	Intact	Tan	0.1
101	Fenimore Road	Exterior	Generator	Metal	Intact	Tan	-0.2
102	Fenimore Road	Exterior	Generator	Metal	Intact	Tan	0.3

Table 3
Summary of XRF Lead Analysis on Paints
Hazardous Materials Inventory Report
Pumping Station Rehabilitation

Sample ID	Pumping Station	Area	Sample Description	Substrate	Condition	Color	Result (mg/cm^2)
115	Archville	Exterior	Pipe	Metal	Deteriorated	Black	0.1
116	Archville	Exterior	Pipe	Metal	Deteriorated	Black	0.1
117	Archville	Exterior	Pipe	Metal	Deteriorated	Black	0.1
118	Archville	Exterior	Fence	Metal	Deteriorated	Green	0.3
119	Archville	Exterior	Fence	Metal	Deteriorated	Green	0.4
120	Archville	Exterior	Fence	Metal	Deteriorated	Green	0.5
121	Archville	Exterior	Control panel	Metal	Intact	Grey	0.1
122	Archville	Exterior	Control panel	Metal	Intact	Grey	0.1
123	Archville	Exterior	Control panel	Metal	Intact	Grey	0.1
124	Archville	Exterior	Generator base	Metal	Intact	Black	0.1
125	Archville	Exterior	Generator base	Metal	Intact	Black	0.2
126	Archville	Exterior	Generator base	Metal	Intact	Black	0.1
127	Archville	Exterior	Generator cover	Metal	Intact	Tan	-0.1
128	Archville	Exterior	Generator cover	Metal	Intact	Tan	-0.3
129	Archville	Exterior	Generator cover	Metal	Intact	Tan	0.1
130	Archville	Exterior	Generator	Metal	Intact	Tan	0.1
131	Archville	Exterior	Generator	Metal	Intact	Tan	0.2
132	Archville	Exterior	Generator	Metal	Intact	Tan	0
133	Archville	Exterior	Panel	Metal	Intact	Tan	0
134	Archville	Exterior	Panel	Metal	Intact	Tan	0.1
135	Archville	Exterior	Panel	Metal	Intact	Tan	0.1
136	Archville	Exterior	Manhole	Metal	Intact	Orange	0.2
137	Archville	Exterior	Manhole	Metal	Intact	Orange	0.4
138	Archville	Exterior	Manhole	Metal	Intact	Orange	0.2
139	Archville	Exterior	Valve box	Metal	Intact	Black	-0.1
140	Archville	Exterior	Valve box	Metal	Intact	Black	0.1
141	Archville	Exterior	Valve box	Metal	Intact	Black	-0.1
142	Archville	Exterior	Power center	Metal	Intact	White	0.1

Table 3
Summary of XRF Lead Analysis on Paints
Hazardous Materials Inventory Report
Pumping Station Rehabilitation

Sample ID	Pumping Station	Area	Sample Description	Substrate	Condition	Color	Result (mg/cm^2)
143	Archville	Exterior	Power center	Metal	Intact	White	-0.1
144	Archville	Exterior	Power center	Metal	Intact	White	-0.1
157	Country Club Lane	Exterior	Control panel	Metal	Intact	Green	0
158	Country Club Lane	Exterior	Control panel	Metal	Intact	Green	0.1
159	Country Club Lane	Exterior	Control panel	Metal	Intact	Green	0
160	Country Club Lane	Exterior	Pipe	Metal	Intact	Green	0.1
161	Country Club Lane	Exterior	Pipe	Metal	Intact	Green	-0.5
162	Country Club Lane	Exterior	Pipe	Metal	Intact	Green	-0.2
163	Country Club Lane	Exterior	Disconnect switch	Metal	Intact	Grey	-0.1
164	Country Club Lane	Exterior	Panel	Metal	Intact	Grey	0.2
165	Country Club Lane	Exterior	Panel	Metal	Intact	Grey	-0.2
166	Country Club Lane	Exterior	Interior wall	Metal	Intact	White	0.1
167	Country Club Lane	Exterior	Interior wall	Metal	Intact	White	0.1
168	Country Club Lane	Exterior	Interior wall	Metal	Intact	White	0.1
169	Country Club Lane	Exterior	Power center	Metal	Intact	White	-0.1
170	Country Club Lane	Exterior	Power center	Metal	Intact	White	-0.1
171	Country Club Lane	Exterior	Power center	Metal	Intact	White	0

Notes:

(1) Samples collected by Mandell Environmental Consulting in July 2020.

(2) The DEP and HUD action level used to define lead based paints is 1 mg/cm^2.
However, any detected concentration of lead in paint has the potential to affect worker health and safety during certain construction activities and shall be addressed in the Contractor's health and safety protocol for the affected work.

(3) Sample results noted above are considered representative of similarly painted structures, equipment, and substrates within the scope of work.

(4) Contractor to verify the locations and extent of each paint.

Table 4
Summary of PCB Analysis
Hazardous Materials Inventory Report
Pumping Station Rehabilitation

Sample ID	*Pumping Station*	*Area*	*Sample Description*	*Substrate*	*Color*	*PCBs (mg/kg)*
FR-PCB-01	Fenimore Road	Dry Well	Railing	Metal	Grey over red	18.5
FR-PCB-02	Fenimore Road	Exterior	Vent piping	Metal	Green	1.75

Notes:
(1) Samples collected by Bidwell Environmental in July 2020.
(2) The regulatory limit for defining TSCA-regulated PCBs is 50 mg/kg.

Table 5
Other Regulated Wastes
Hazardous Materials Inventory Report
Pumping Station Rehabilitation

Pumping Station	*Area/ Equipment*	*Description (Quantity)*	*Waste Classification*	*Quantity*
Weaver Street	Dry Well	Lighting bulbs	Universal waste	34 bulbs
		Lighting ballasts	Non-hazardous TSCA regulated waste (if PCBs), Non-hazardous regulated waste (if no PCBs)	17 ballasts
		Emergency lighting	Universal waste	8 bulbs
			Electronic waste	4 circuit boards
			Universal waste	4 batteries
		Exit signs	Electronic waste	1 circuit boards
			Universal waste	1 battery
Fenimore Road	Dry Well	Fire extinguisher	Regulated waste	1 fire extinguisher
		Emergency lighting	Universal waste	4 bulbs
			Electronic waste	2 circuit boards
			Universal waste	2 batteries
		Lighting bulbs	Universal waste	3 bulbs
		Lighting ballasts	Non-hazardous TSCA regulated waste (if PCBs), Non-hazardous regulated waste (if no PCBs)	3 ballasts
Country Club Lane	Electrical panel	Lighting bulbs	Universal waste	2 bulbs
		Lighting ballasts	Non-hazardous TSCA regulated waste (if PCBs), Non-hazardous regulated waste (if no PCBs)	1 ballast
		Panel	Universal waste	1 battery
			Electronic waste	1 circuit board

Table 6
Inaccessible Suspect Materials Requiring Further Investigation
Hazardous Materials Inventory Report
Pumping Station Rehabilitation

Material Description	*Pumping Station*	*Location*	*Quantity*	*Comments*
Black vibration damper cloth in HVAC system	Weaver Street	Dry Well	120 ft^2	Vibration damper cloth could not be sampled without destructive means. Vibration damper cloth should be surveyed for asbestos prior to demolition.
All	Weaver Street	Wet Well	Unknown	The Wet Well interior was inaccessible at the time of the hazards assessment. A hazards assessment should be performed prior to work within the Wet Well interior.
Black vibration damper cloth in HVAC system	Fenimore Road	Dry Well	12 ft^2	Vibration damper cloth could not be sampled without destructive means. Vibration damper cloth should be surveyed for asbestos prior to demolition.
Gaskets in vent piping	Fenimore Road	Exterior	4 ft^2 (6 gaskets)	Gaskets could not be sampled without opening vent piping flanges. Gaskets should be surveyed for asbestos prior to demolition.
All	Fenimore Road	Wet Well	Unknown	The Wet Well interior was inaccessible at the time of the hazards assessment. A hazards assessment should be performed prior to work within the Wet Well interior.
All	Archville	Dry Well	Unknown	The Dry Well interior was inaccessible at the time of the hazards assessment. A hazards assessment should be performed prior to work within the Dry Well interior.
All	Archville	Wet Well	Unknown	The Wet Well interior was inaccessible at the time of the hazards assessment. A hazards assessment should be performed prior to work within the Wet Well interior.
All	Country Club Lane	Pump Station	Unknown	The Pump Station interior was inaccessible at the time of the hazards assessment. A hazards assessment should be performed prior to work within the Pump Station interior.

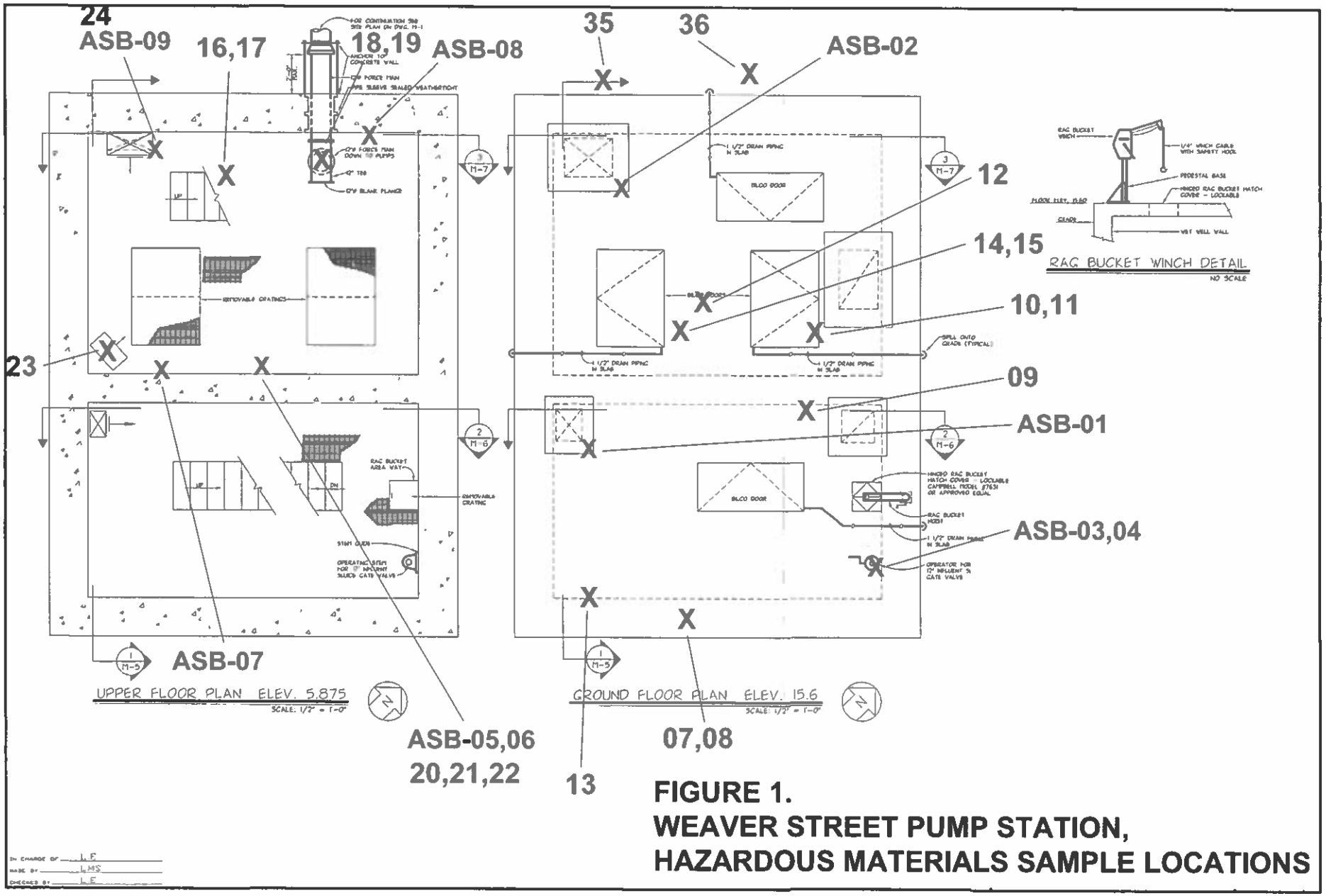


FIGURE 1.
WEAVER STREET PUMP STATION,
HAZARDOUS MATERIALS SAMPLE LOCATIONS

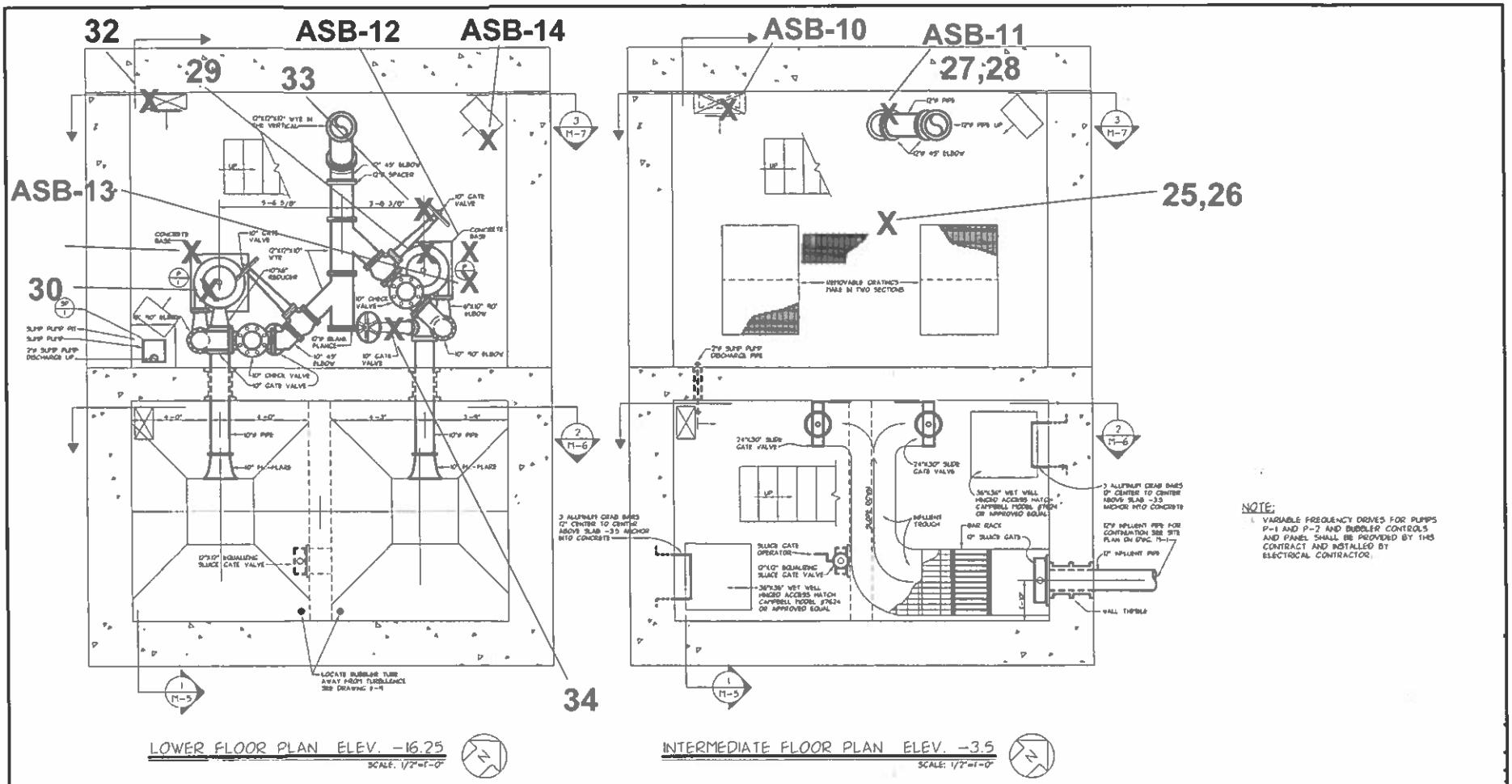


FIGURE 2.
WEAVER STREET PUMP STATION,
HAZARDOUS MATERIALS SAMPLE LOCATIONS

IN CHARGE OF L.E.
MADE BY LMS
CHECKED BY L.E.

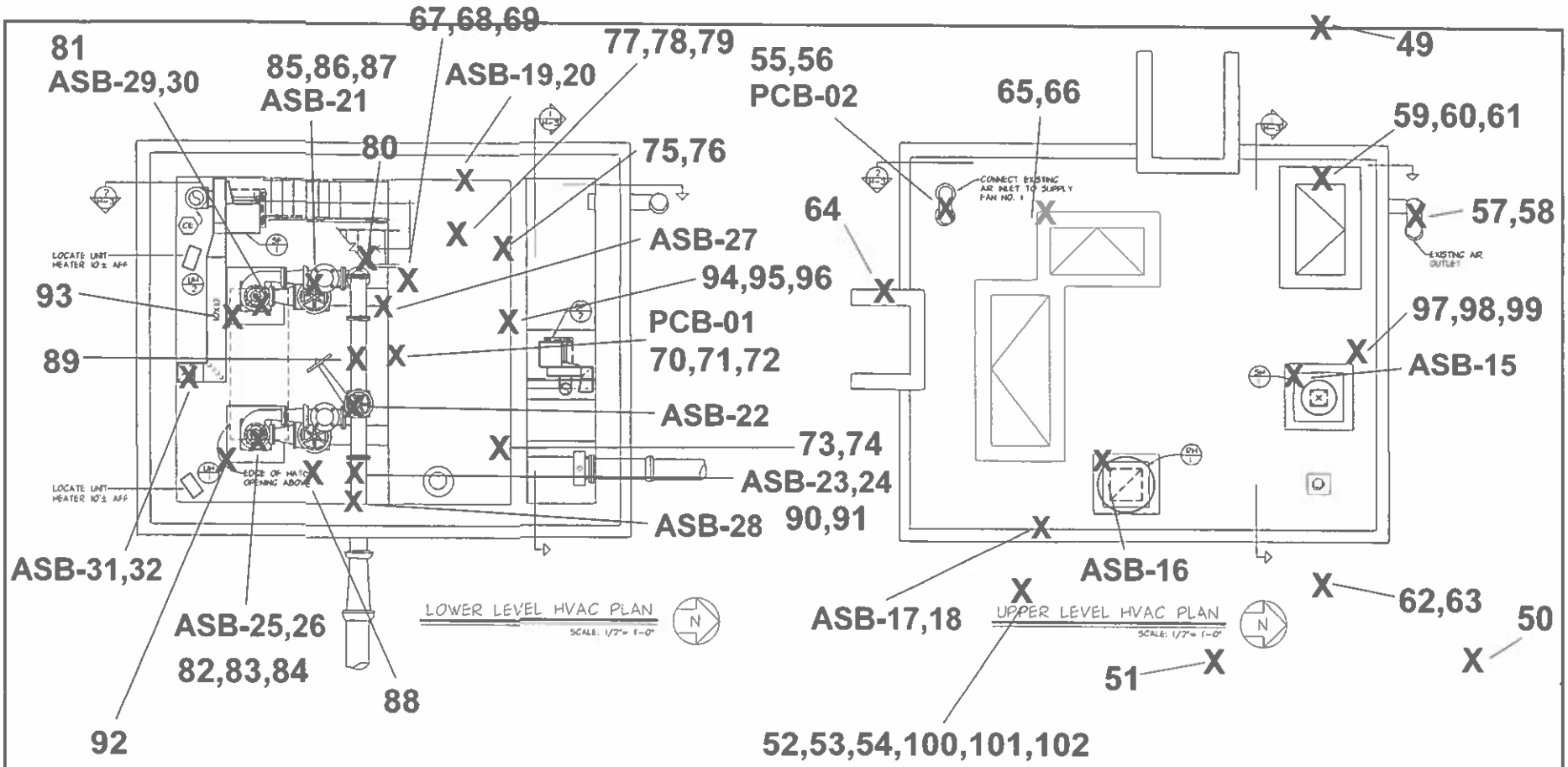


FIGURE 3.
FENIMORE ROAD PUMP STATION,
HAZARDOUS MATERIALS SAMPLE LOCATIONS

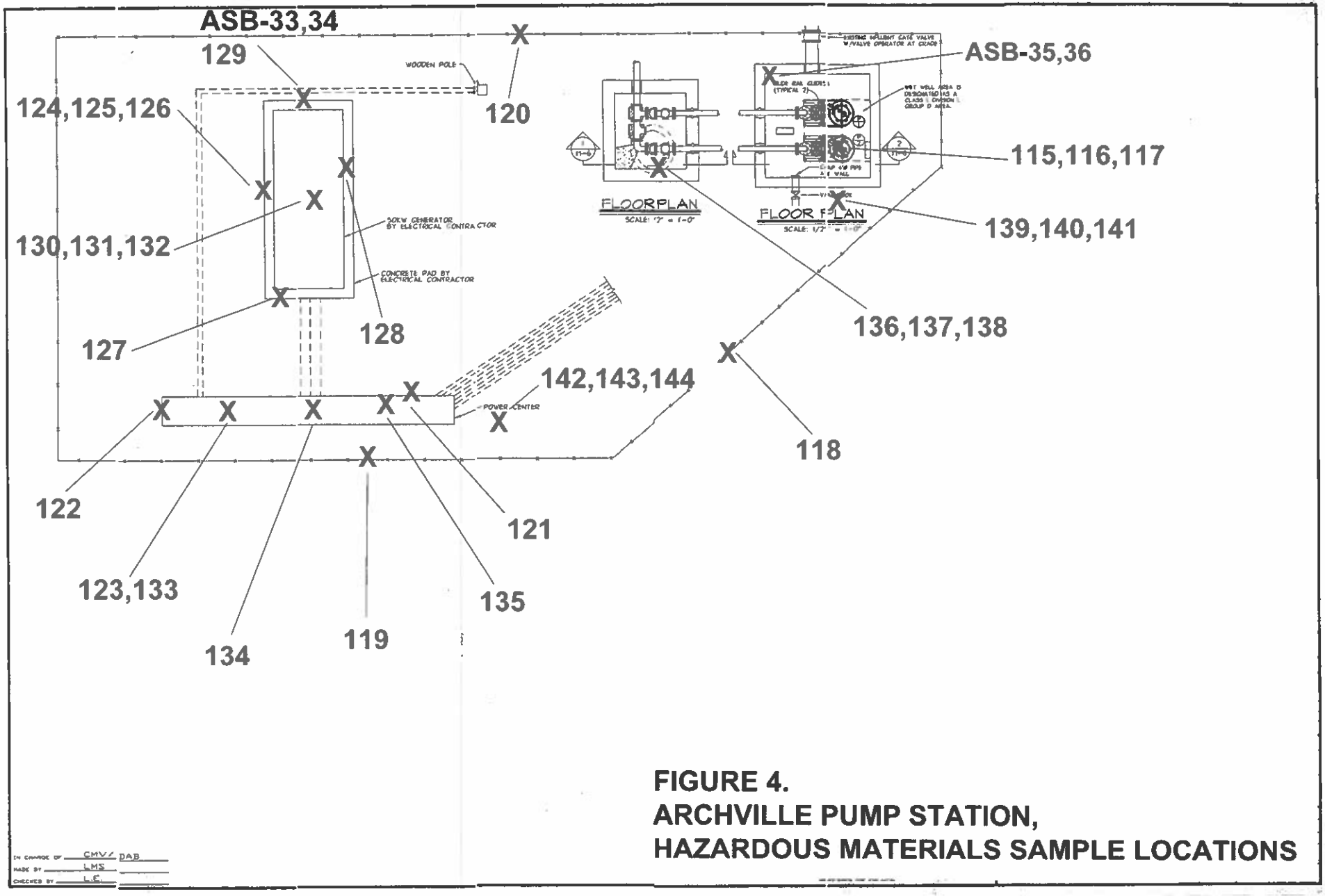
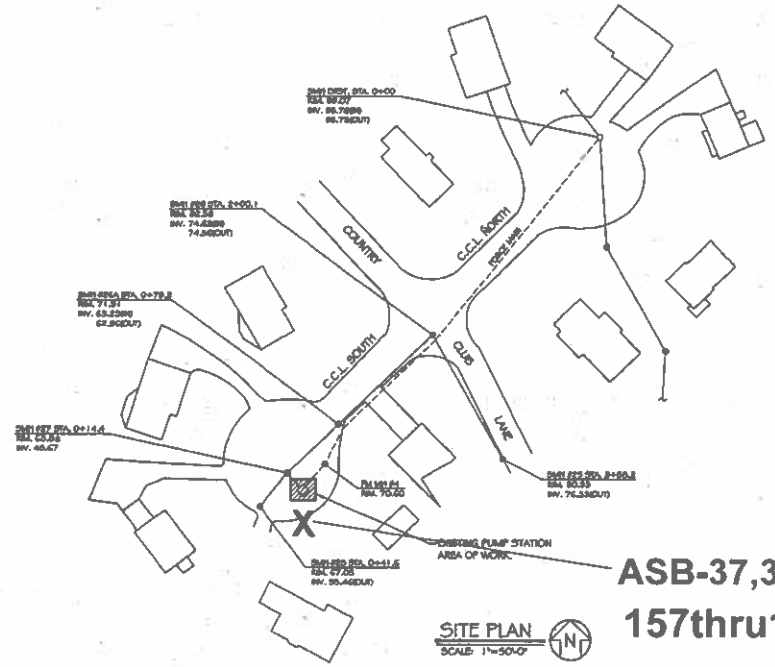


FIGURE 4.
ARCHVILLE PUMP STATION,
HAZARDOUS MATERIALS SAMPLE LOCATIONS

IN CHARGE OF CMV / DAB
MADE BY LMS
CHECKED BY L.E.

LOCATION PLAN



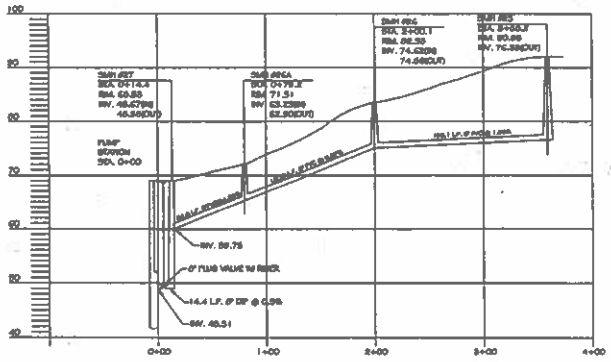
SITE PLAN

SCALE: 1"=50'-0"

ASB-37,38
157thru171

LEGEND	
SYMBOL	DESCRIPTION
	EXISTING
	NEW WORK
	EXISTING WORK TO BE REMOVED
	GATE VALVE
	CHECK VALVE
	REDUCER
	90° ELBOW
	45° ELBOW
	PIPE SPACER
	DENOTES SECTION (ON DWG. M-2
	DENOTES CONNECT NEW TO EXISTING
	DENOTES PUMP NO.
	BACKFLOW PREVENTER
	NOISE SEED
	WATER METER
	GATE VALVE

NOTE: ALL WORK SHOWN IS NEW UNLESS NOTED OTHERWISE.



PROFILE

SCALE: HORZ. 1"=50'
VERT. 1"=10'

IN CHARGE OF MAT/JAT
MADE BY LMS
CHECKED BY MAT/JAT

FIGURE 5.
COUNTRY CLUB LANE PUMP STATION,
HAZARDOUS MATERIALS SAMPLE LOCATIONS

ATTACHMENT A

Laboratory Data Reports and

NYS ELAP Certifications

APL
AQUA PRO-TECH LABORATORIES
Certified Environmental Testing

ANALYTICAL RESULTS

REDUCED DELIVERABLES FORMAT

APL Work Order Number: 0071061

Bidwell Environmental

Project: Westchester PS

Brian Wood
Laboratory Director

All Results meet the requirements of the National Environmental Laboratory Accreditation Conference and/or State specific certifications as applicable.

Report Date: Aug 19, 2020

1275 Bloomfield Ave., Bldg. 6, Fairfield, New Jersey 07004
(t) 973.227.0422 (f) 973.227.2813 (w) www.aquaprotechlabs.com

NELAC National Environmental Laboratory Accreditation Conference
NJDEP #07010 / NYDOH #11634 / PADEP #68-02903

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APL
AQUA PRO-TECH LABORATORIES
Certified Environmental Testing

Sample Summary

Work Order: 0071061

Client: Bidwell Environmental

Project: Westchester PS

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
FR-PCB-01	0071061-01	Paint Chips	07/08/2020 11:30	07/23/2020 11:00
FR-PCB-02	0071061-02	Paint Chips	07/08/2020 11:35	07/23/2020 11:00

CHAIN OF CUSTODY

APL 0071061

AQUA PRO-TECH LABORATORIES

www.aquaprotechlabs.com

Fairfield, NJ 07004

TEL: 973-227-0422

FAX: 973-227-2813

Page 1 of 1

	BIDWELL	Send Report To:	SAME
	1353 KINGS HIGHWAY	Address:	
	SUGAR LOAF, NY 10981		
Phone:	845 610 3993	Phone:	
E-Mail:	MWELLOCK@BIDWELLENVIRONMENTAL.COM	Send Invoice To:	SAME
Project Name:	WESTCHESTER PS	Address:	
Project Manager:	MICHAEL WELLOCK	Sampling Location:	
Project or PO #:		Sampled By:	

Turn-Around Time

- [X] APL Standard 2 Weeks
- [ ] Rush (Choose One Below)
- [ ] 1 Day [ ] 2 Days [ ] 3 Days
- [ ] 1 Week [ ] Other (Specify Below)

Date and Time Required: _____

**May Need Lab Approval

Report / Electronic Format

- [ ] **Results Only** / NY ASP-A
- [X] **Reduced:** NJ DEP
- [ ] **Full:** NJ DEP / NY ASP-B
- [ ] State Forms/E2 Reporting
- [ ] Excel Summary
- [ ] EqUIS
- [ ] EnviroData
- [ ] Hazsite EDD

PWSID # _____ SRP# _____

Contamination Level

- [ ] Low
- [ ] Medium
- [ ] High

Comments/Special Instructions:

Cooler Temp: 4.0

Matrix Abbreviations:

DW - Drinking Water; GW - Groundwater; WW - Wastewater; SW - Surface Water; L - Lake; Pool; SPA; S - Soil; SD - Solid; SL - Sludge; C - Concrete; W - Wipes; O - Oil; PC - Paint Chips

APL Order # (APL Will Provide): 0071061

Sample #	Sample Source: Field ID	Collect Date	Collect Time	Matrix	Sample Type: Grab	Sample Type: Comp	No. of Bottles	Preservative	ANALYSIS REQUESTED: PCB (soxhlet)
01	FR-PCB-01	7/8/20	11:30	PC	X		1	—	X
02	FR-PCB-02	7/8/20	11:35	PC	X		1	—	X

RELINQUISHED BY:	Print: MICHAEL WELLOCK	RECEIVED BY:	Print: John Gonzalez	Date:	7-23-2020
	Sign:		Sign:	Time:	9:06 AM
RELINQUISHED BY:	Print: John Gonzalez	RECEIVED BY:	Print:	Date:	7/23
	Sign: John Gonzalez		Sign:	Time:	1130
RELINQUISHED BY:	Print:	RECEIVED BY:	Print:	Date:	
	Sign:		Sign:	Time:	

CERTIFICATIONS: NELAP (National Environmental Accreditation Program) NJDEP #07010 PADEP #68-02903 NYDOH #11634

By signing this Chain of Custody Agreement, customer expressly agrees to pay APL for all charges, reasonably incurred in connection with analysis and reporting for these samples.

Extractable Petroleum Hydrocarbons:

Gas Chromatography/Flame Ionization Detector

New Jersey Department of Environmental Protection Site Remediation Program Extractable Petroleum Hydrocarbons Methodology (Version 3.0).
USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8015B or
NJDEP Office of Quality Assurance Quantitation of Semi-Volatile Petroleum Products in Water, Soil and Sediment OQA-QAM-025, Revision 6.

Metals:

Inductively-Coupled Plasma Atomic Emission Spectrometry or Inductively-Coupled Plasma Mass Spectroscopy

Wastewater and Groundwater Samples: USEPA Methods for the Analysis of Water and Wastes, Method 200.7, Method 200.8.
Soil Samples: USEPA Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 6010D.

Mercury:

Cold Vapor Atomic Absorption Spectrometry

Wastewater and Groundwater Samples: USEPA Methods for the Analysis of Water and Wastes, Method 245.1.
Soil Samples: USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 7471B.

Volatile Organic Compounds:

Purge and Trap Gas Chromatography/Mass Spectroscopy

Drinking Water Samples: USEPA Methods for the Determination of Organic Compounds in Drinking Water, Method 524.2.
Wastewater Samples: USEPA Methods for the Analysis of Water and Wastes, Method 624.1, Method 8260C.
Soil and Groundwater Samples: USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8260C.

Semi-Volatile Organic Compounds:

Gas Chromatography/Mass Spectroscopy

Wastewater Samples: USEPA Methods for the Analysis of Water and Wastes, Method 625.1, Method 8270D.
Soil and Groundwater Samples: USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8270D.

PFAS Compounds:

Liquid Chromatography/Tandem Mass Spectroscopy

Drinking Water Samples: USEPA Methods for the Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), Method 537.

Pesticides:

Gas Chromatography/Electron Capture Detector

Wastewater Samples: USEPA Methods for the Analysis of Water and Wastes, Method 608.3, Method 8081B.
Soil and Groundwater Samples: USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8081B.

Polychlorinated Biphenyls (PCBs):

Gas Chromatography/Electron Capture Detector

Wastewater Samples: USEPA Methods for the Analysis of Water and Wastes, Method 608.3, Method 8082A.
Soil and Groundwater Samples: USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8082A.

General Chemistry Methods:

Various general chemistry methods are taken from "Standard Methods for the Examination of Water and Wastewater, 19th Edition".

Specific method citations can be found on the Analytical Results Summary page of this report listed under 'Method'.

** A complete list of APL's certified Methods are accessible on the Standards And Docs page of the Results Retrieval System

MDL:

Method Detection Limit. The minimum reportable concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The value is calculated from the analysis of seven replicates of a spike sample. On analytical reports this value is corrected for percent moisture and any concentration or dilution factors.

RL:

Reporting Limit. The Concentration of the lowest calibration standard that was included in the initial calibration of the instrument. On analytical reports this value is corrected for percent moisture and any concentration or dilution factors.

Concentration (Conc) / Result:

If the compound is detected, the measured concentration is reported. If this column is left blank, or contains a 'less than' (<) symbol, the compound was not detected.

Tentatively Identified Compound (TIC):

A TIC is a non-targeted compound, not included in the calibration, identified by a mass spectral library search.

Qualifiers:

- **U:** Indicates the compound was analyzed for but was not detected.
- **J:** Indicates an estimated value. All tentatively identified compounds (TICs) and results below the RL receive this qualifier.
- **B:** Indicates the analyte was found in the method blank as well as the sample.
- **N:** Used when reporting a specific tentatively identified compound.
- **E:** Indicates that the concentration of the compound exceeds the calibration range of the instrument. The results of a diluted analysis will also be reported. The results of the dilution should be used for those compounds exceeding the calibration range in the undiluted analysis.

DATA OF KNOWN QUALITY CONFORMANCE/NON-CONFORMANCE SUMMARY QUESTIONNAIRE

Laboratory Name: Aqua Pro-Tech Laboratories

Client: Bidwell Environmental

Project Location: Westchester PS

Project Number: 0071061

Laboratory Sample ID(s): 01-02

Sampling Date(s): July 8,2020

List DKQP Methods Used: SW 846 8082A;Gravimetric

1	For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards?	☑ Yes ☐ No
1A	Were the method specified handling, preservation, and holding time requirements met?	☑ Yes ☐ No
1B	EPH Method: Was the EPH method conducted without significant modifications (see Section 11.3 of respective DKQ methods)	☐ Yes ☐ No ☑ N/A
2	Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)?	☑ Yes ☐ No
3	Were samples received at an appropriate temperature (4±2° C)?	☑ Yes ☐ No ☐ N/A
4	Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved?	☐ Yes ☑ No
5	Were reporting limits specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?	☑ Yes ☐ No
	Were these reporting limits met?	☐ Yes ☑ No ☐ N/A
6	For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP?	☑ Yes ☐ No
7	Are project-specific matrix spikes and/or laboratory duplicates included in this data set?	☑ Yes ☐ No

Notes: For all questions to which the response was "No° (with the exception of question #7), additional information should be provided in an attached narrative. If the answer to question #1, #1A, or #1B is "No", the data package does not meet the requirements for Data of Known Quality.°

QUALITY CONTROL
Conformance/Non-Conformance Summary

ANALYSIS: PCBs [8082A]

COMMENTS:
The surrogate (Decachlorobiphenyl) recovery for samples 0071061-01 and 02 was outside QC limits (high).
The surrogate (Decachlorobiphenyl [2C]) recovery for sample 0071061-02 was outside QC limits (high).

Reviewed By: _____ (JC) 8/18/2020
Brian Wood - Laboratory Director — Date

For any questions about your Quality Control, please call us at 973-227-0422

APL

AQUA PRO-TECH LABORATORIES
Certified Environmental Testing

Positive Results Only Summary

0071061-01 (Paint Chips) Sample Name: **FR-PCB-01**

SW 846 8082A - PCBs

Analyte	Result	Qual	MDL	RL	Units	Dilution	Analyzed
Aroclor-1254 [2C]	18.5	D	0.112	1.20	mg/kg dry	5	7/28/20 14:43
Total PCBs	18.5	D	0.112	1.20	mg/kg dry	5	7/28/20 14:43

0071061-02 (Paint Chips) Sample Name: **FR-PCB-02**

SW 846 8082A - PCBs

Analyte	Result	Qual	MDL	RL	Units	Dilution	Analyzed
Aroclor-1254	1.75		0.0399	0.248	mg/kg dry	1	7/28/20 14:22
Total PCBs	1.75		0.0231	0.248	mg/kg dry	1	7/28/20 14:22

ND - Indicates compound analyzed for but not detected
J - Indicates estimated value
B - Indicates compound found in associated blank
E - Concentration exceeds highest calibration standard
D - Indicates result is based on a dilution
H - Indicates a Hold Time violation
P - Greater than 25% diff. between 2 GC columns.
MDL - Minimum detection limit, **RL** - Reporting limit

APL
AQUA PRO-TECH LABORATORIES
Certified Environmental Testing

All Results Summary

Client: Bidwell Environmental
Project: Westchester PS
Work Order: 0071061
Date to Lab: 7/23/2020 11:00:00AM

0071061-01 (Paint Chips) Sample Name: **FR-PCB-01** Collected: **7/8/2020 11:30:00AM**

SW 846 8082A - PCBs

Analyte	Result	Qual	MDL	RL	Units	Dilution	Analyzed
Aroclor-1016	ND	U	0.161	1.20	mg/kg	5	7/28/20 14:43
Aroclor-1221	ND	U	0.317	1.20	mg/kg	5	7/28/20 14:43
Aroclor-1232	ND	U	0.403	1.20	mg/kg	5	7/28/20 14:43
Aroclor-1242	ND	U	0.236	1.20	mg/kg	5	7/28/20 14:43
Aroclor-1248	ND	U	0.247	1.20	mg/kg	5	7/28/20 14:43
Aroclor-1254 [2C]	**18.5**	D	**0.112**	**1.20**	**mg/kg**	**5**	**7/28/20 14:43**
Aroclor-1260	ND	U	0.150	1.20	mg/kg	5	7/28/20 14:43
Aroclor-1262	ND	U	0.323	1.20	mg/kg	5	7/28/20 14:43
Aroclor-1268	ND	U	0.145	1.20	mg/kg	5	7/28/20 14:43
Total PCBs	**18.5**	D	**0.112**	**1.20**	**mg/kg**	**5**	**7/28/20 14:43**

Gravimetric - General Chemistry

Analyte	Result	Qual	MDL	RL	Units	Dilution	Analyzed
Percent Solids	**100**				**%**	**1**	**7/23/20 13:59**

0071061-02 (Paint Chips) Sample Name: **FR-PCB-02** Collected: **7/8/2020 11:35:00AM**

SW 846 8082A - PCBs

Analyte	Result	Qual	MDL	RL	Units	Dilution	Analyzed
Aroclor-1016	ND	U	0.0332	0.248	mg/kg	1	7/28/20 14:22
Aroclor-1221	ND	U	0.0653	0.248	mg/kg	1	7/28/20 14:22
Aroclor-1232	ND	U	0.0831	0.248	mg/kg	1	7/28/20 14:22
Aroclor-1242	ND	U	0.0486	0.248	mg/kg	1	7/28/20 14:22
Aroclor-1248	ND	U	0.0509	0.248	mg/kg	1	7/28/20 14:22
Aroclor-1254	**1.75**		**0.0399**	**0.248**	**mg/kg**	**1**	**7/28/20 14:22**
Aroclor-1260	ND	U	0.0310	0.248	mg/kg	1	7/28/20 14:22
Aroclor-1262	ND	U	0.0666	0.248	mg/kg	1	7/28/20 14:22
Aroclor-1268	ND	U	0.0299	0.248	mg/kg	1	7/28/20 14:22
Total PCBs	**1.75**		**0.0231**	**0.248**	**mg/kg**	**1**	**7/28/20 14:22**

Gravimetric - General Chemistry

Analyte	Result	Qual	MDL	RL	Units	Dilution	Analyzed
Percent Solids	**100**				**%**	**1**	**7/23/20 13:59**

ND, U - Indicates compound analyzed for but not detected
J - Indicates estimated value
B - Indicates compound found in associated blank
E - Concentration exceeds highest calibration standard
D - Indicates result is based on a dilution
H - Indicates a Hold Time violation
P - Greater than 25% diff. between 2 GC columns.
MDL - Minimum detection limit, **RL** - Reporting limit

AQUA PRO-TECH LABORATORIES
Certified Environmental Testing

PCBs

Bidwell Environmental

Work Order: 0071061

Project: Westchester PS

ANALYSIS DATA SHEET

PCBs - SW 846 8082A

Client:	**Bidwell Environmental**	**Project:**	**Westchester PS**
Client Sample ID:	**Blank**	**Work Order:**	**0071061**
Lab Sample ID:	**B0G1671-BLK1**		

		Prep Date:	07/30/2020 15:22	File ID:	6B42409.D
Init/Final Vol:	15 g / 10 mL	Prep Batch:	B0G1671	Analyzed:	08/17/2020 10:24
		Matrix:	Soil	Sequence:	S0H1704
		Prep Method:	Soxhlet		

CAS NO.	COMPOUND	CONC. (mg/kg wet)	MDL	RL	Qual
12674-11-2	Aroclor-1016	ND	0.00443	0.0330	U
11104-28-2	Aroclor-1221	ND	0.00870	0.0330	U
11141-16-5	Aroclor-1232	ND	0.0111	0.0330	U
53469-21-9	Aroclor-1242	ND	0.00648	0.0330	U
12672-29-6	Aroclor-1248	ND	0.00678	0.0330	U
11097-69-1	Aroclor-1254	ND	0.00533	0.0330	U
11096-82-5	Aroclor-1260	ND	0.00413	0.0330	U
37324-23-5	Aroclor-1262	ND	0.00888	0.0330	U
11100-14-4	Aroclor-1268	ND	0.00399	0.0330	U
1336-36-3	Total PCBs	ND	0.00308	0.0330	U

Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200817\6B42409.D\ECD1A.CH Vial: 97
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200817\6B42409.D\ECD2B.CH
Acq On : 17 Aug 2020 10:24 Operator: RL
Sample : B0G1671-BLK1 Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Aug 17 10:55 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Initial Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um

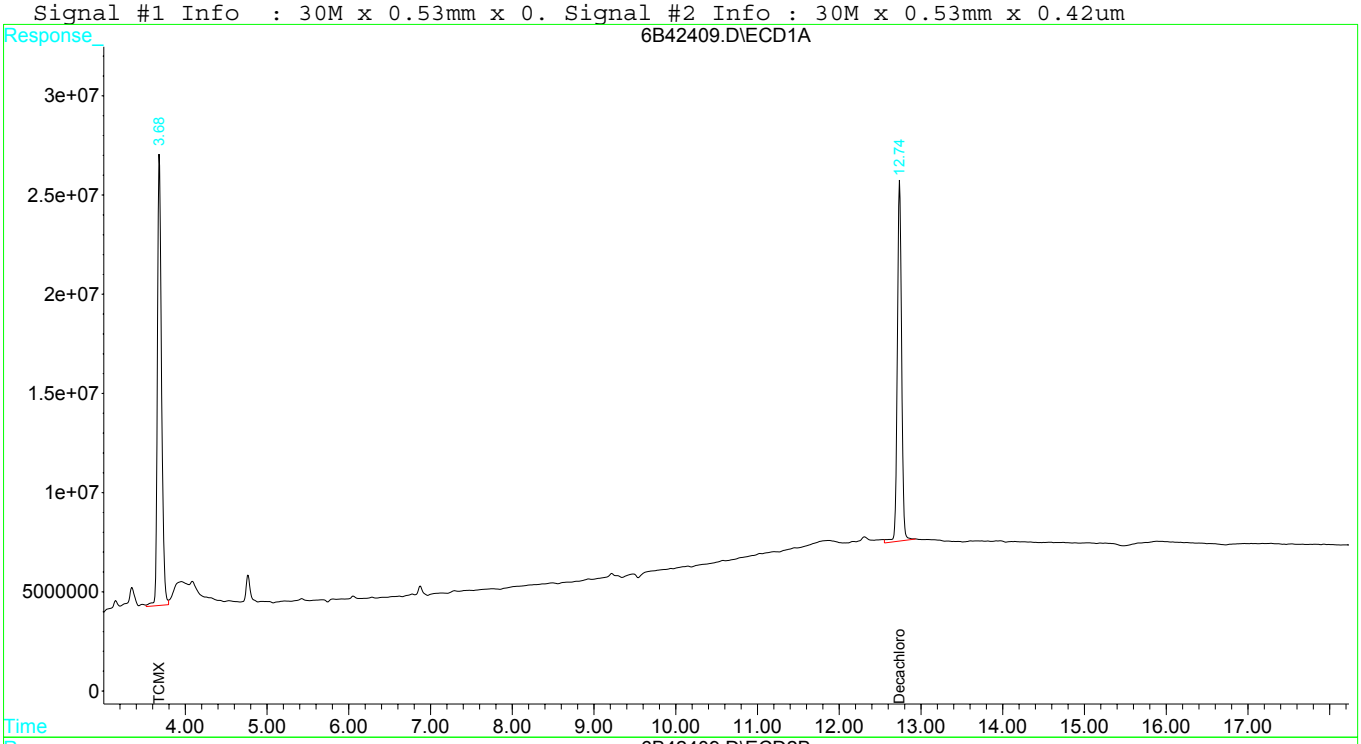
Compound	RT#1	RT#2	Resp#1	Resp#2	ug/kg	ug/kg
System Monitoring Compounds						
1) S TCMX	3.68	4.43	794.6E6	334.1E6	51.323	51.670
Spiked Amount 50.000	Range 40 - 149		Recovery =		102.65%	103.34%
2) S Decachlorobiphen	12.74	16.70f	661.3E6	270.9E6	42.284m	41.339
Spiked Amount 50.000	Range 52 - 136		Recovery =		84.57%	82.68%
Target Compounds						
Sum Aroclor-1016 (1)			0	0	N.D.	N.D.
Average Aroclor-1016 (1)					0.000	0.000
Sum Aroclor-1221 (1)			0	0	N.D.	N.D.
Average Aroclor-1221 (1)					0.000	0.000
Sum Aroclor-1232 (1)			0	0	N.D.	N.D.
Average Aroclor-1232 (1)					0.000	0.000
Sum Aroclor-1242 (1)			0	0	N.D.	N.D.
Average Aroclor-1242 (1)					0.000	0.000
Sum Aroclor-1248 (1)			0	0	N.D.	N.D.
Average Aroclor-1248 (1)					0.000	0.000
Sum Aroclor-1254 (1)			0	0	N.D.	N.D.
Average Aroclor-1254 (1)					0.000	0.000
Sum Aroclor-1260 (1)			0	0	N.D.	N.D.
Average Aroclor-1260 (1)					0.000	0.000
Sum Aroclor-1262 (1)			0	0	N.D.	N.D.
Average Aroclor-1262 (1)					0.000	0.000
Sum Aroclor-1268 (1)			0	0	N.D.	N.D.
Average Aroclor-1268 (1)					0.000	0.000

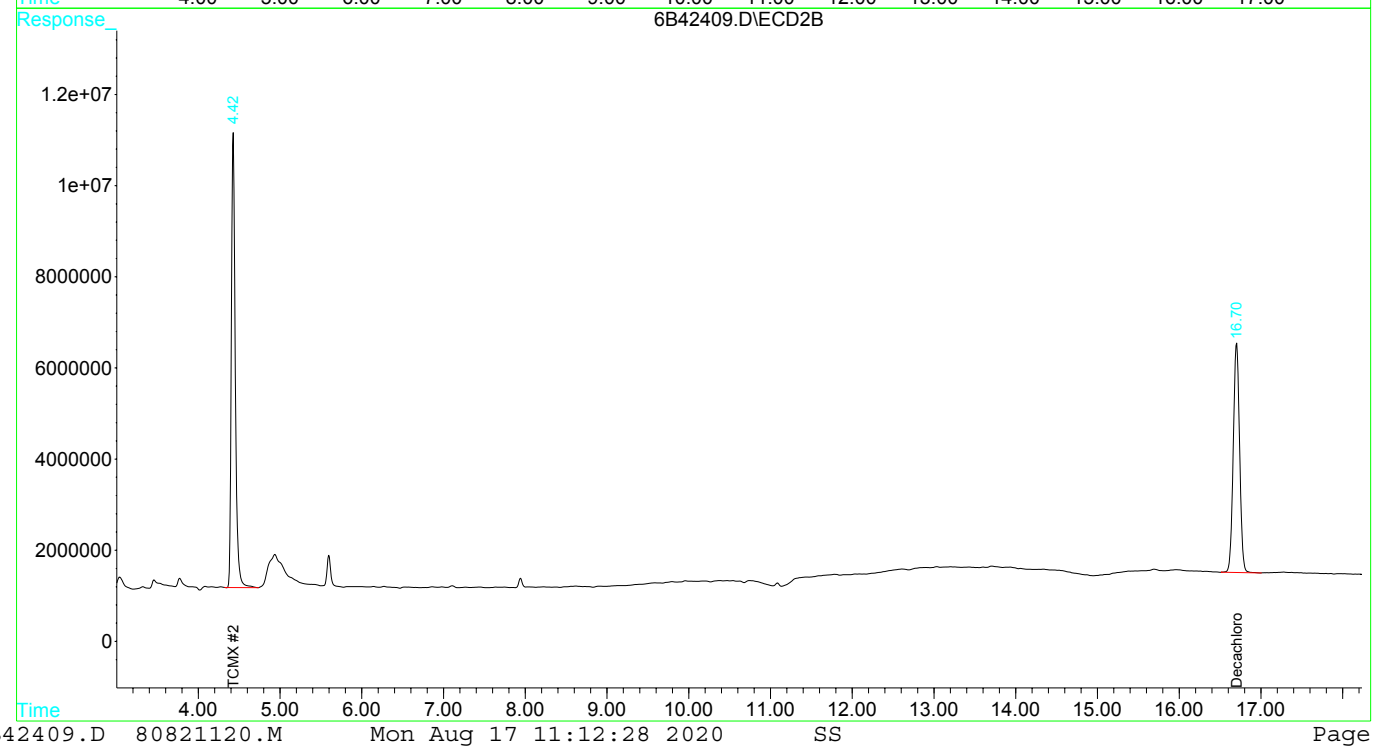
Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200817\6B42409.D\ECD1A.CH Vial: 97
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200817\6B42409.D\ECD2B.CH
Acq On : 17 Aug 2020 10:24 Operator: RL
Sample : B0G1671-BLK1 Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Aug 17 10:55 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Multiple Level Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um





ANALYSIS DATA SHEET

PCBs - SW 846 8082A

Client: **Bidwell Environmental**
Client Sample ID: **FR-PCB-01**
Lab Sample ID: **0071061-01**
Project: **Westchester PS**
Work Order: **0071061**

Date Sampled:	07/08/20 11:30	Prep Date:	07/24/20 16:00	File ID:	6B41861.D
Init/Final Vol:	2.06 g / 10 mL	Prep Batch:	B0G1671	Analyzed:	07/28/20 14:43
Dilution:	5	Matrix:	Paint Chips	Sequence:	S0G2815
Percent Solids:	100.00	Prep Method:	Soxhlet		

CAS NO.	COMPOUND	CONC. (mg/kg dry)	MDL	RL	Qual
12674-11-2	Aroclor-1016	ND	0.161	1.20	U
11104-28-2	Aroclor-1221	ND	0.317	1.20	U
11141-16-5	Aroclor-1232	ND	0.403	1.20	U
53469-21-9	Aroclor-1242	ND	0.236	1.20	U
12672-29-6	Aroclor-1248	ND	0.247	1.20	U
11097-69-1	Aroclor-1254 [2C]	18.5	0.112	1.20	D
11096-82-5	Aroclor-1260	ND	0.150	1.20	U
37324-23-5	Aroclor-1262	ND	0.323	1.20	U
11100-14-4	Aroclor-1268	ND	0.145	1.20	U
1336-36-3	Total PCBs	18.5	0.112	1.20	D

ND, U - Indicates compound analyzed for but not detected
J - Indicates estimated value
B - Indicates compound found in associated blank
E - Concentration exceeds highest calibration standard
D - Indicates result is based on a dilution
H - Indicates a Hold Time violation
P - Greater than 25% diff. between 2 GC columns.
MDL - Minimum detection limit, **RL** - Reporting limit

Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200728\6B41861.D\ECD1A.CH Vial: 9
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200728\6B41861.D\ECD2B.CH
Acq On : 28 Jul 2020 14:43 Operator: RL
Sample : 0071061-01@5 Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Jul 28 15:04 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Initial Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um

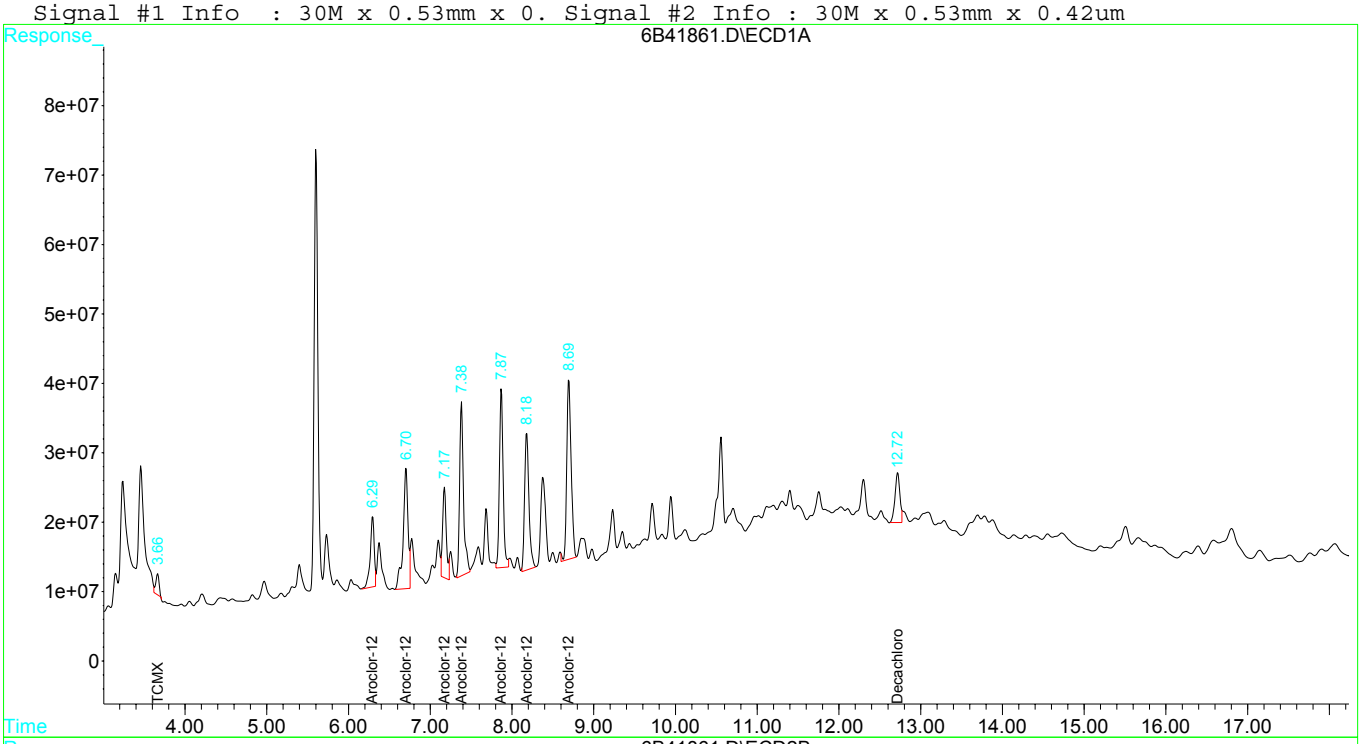
Compound	RT#1	RT#2	Resp#1	Resp#2	ug/kg	ug/kg
System Monitoring Compounds						
1) S TCMX	3.66	4.43	85181559	49249645	5.502m	7.617 #
Spiked Amount 50.000	Range 40 - 149		Recovery =		11.00%#	15.23%#
2) S Decachlorobiphen	12.72f	16.70f	292.4E6	57059278	18.699m	8.706m#
Spiked Amount 50.000	Range 52 - 136		Recovery =		37.40%#	17.41%#
Target Compounds						
Sum Aroclor-1016 (1)			0	0	N.D.	N.D.
Average Aroclor-1016 (1)					0.000	0.000
Sum Aroclor-1221 (1)			0	0	N.D.	N.D.
Average Aroclor-1221 (1)					0.000	0.000
Sum Aroclor-1232 (1)			0	0	N.D.	N.D.
Average Aroclor-1232 (1)					0.000	0.000
Sum Aroclor-1242 (1)			0	0	N.D.	N.D.
Average Aroclor-1242 (1)					0.000	0.000
Sum Aroclor-1248 (1)			0	0	N.D.	N.D.
Average Aroclor-1248 (1)					0.000	0.000
30) L8 Aroclor-1254 (1)	6.29f	8.15	336.1E6	167.2E6	544.524m	699.988 #
31) L8 Aroclor-1254 (2)	6.71	8.48	715.1E6	208.3E6	472.975	685.894 #
32) L8 Aroclor-1254 (3)	7.17f	9.15f	423.2E6	179.5E6	692.297m	803.539m
33) L8 Aroclor-1254 (4)	7.38f	9.38f	825.1E6	363.8E6	676.125m	745.511m
34) L8 Aroclor-1254 (5)	7.87f	9.81f	823.5E6	303.3E6	700.042m	697.897m
35) L8 Aroclor-1254 (6)	8.18f	10.14f	733.1E6	210.0E6	766.536m	755.966m
36) L8 Aroclor-1254 (7)	8.69f	10.87f	972.6E6	465.2E6	755.680m	950.445m#
Sum Aroclor-1254 (1)			4828.6E6	1897.4E6	4608.179	5339.240
Average Aroclor-1254 (1)					658.311	762.749
Sum Aroclor-1260 (1)			0	0	N.D.	N.D.
Average Aroclor-1260 (1)					0.000	0.000
Sum Aroclor-1262 (1)			0	0	N.D.	N.D.
Average Aroclor-1262 (1)					0.000	0.000
Sum Aroclor-1268 (1)			0	0	N.D.	N.D.
Average Aroclor-1268 (1)					0.000	0.000

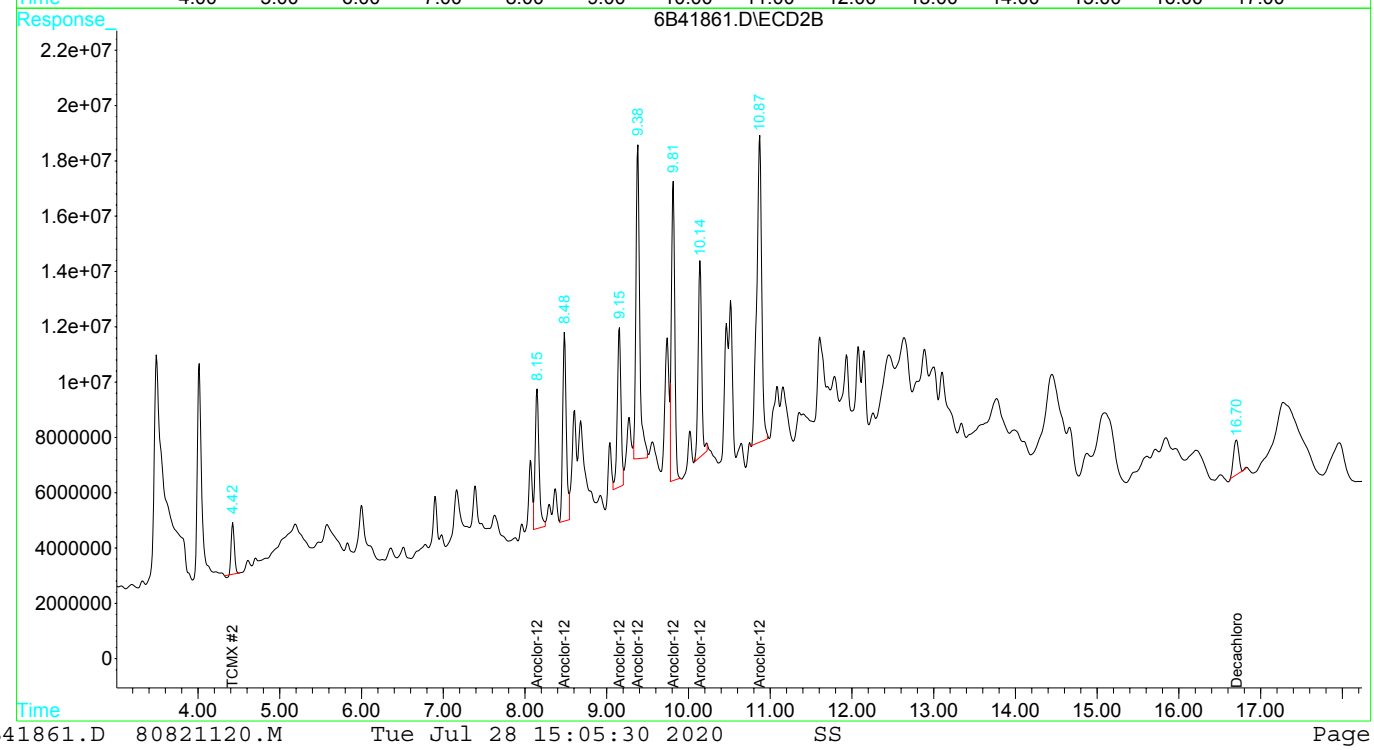
Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200728\6B41861.D\ECD1A.CH Vial: 9
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200728\6B41861.D\ECD2B.CH
Acq On : 28 Jul 2020 14:43 Operator: RL
Sample : 0071061-01@5 Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Jul 28 15:04 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Multiple Level Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um





ANALYSIS DATA SHEET

PCBs - SW 846 8082A

Client: **Bidwell Environmental**
Client Sample ID: **FR-PCB-02**
Lab Sample ID: **0071061-02**
Project: **Westchester PS**
Work Order: **0071061**

Date Sampled:	07/08/20 11:35	Prep Date:	07/24/20 16:00	File ID:	6B41860.D
Init/Final Vol:	2 g / 10 mL	Prep Batch:	B0G1671	Analyzed:	07/28/20 14:22
Dilution:	1	Matrix:	Paint Chips	Sequence:	S0G2815
Percent Solids:	100.00	Prep Method:	Soxhlet		

CAS NO.	COMPOUND	CONC. (mg/kg dry)	MDL	RL	Qual
12674-11-2	Aroclor-1016	ND	0.0332	0.248	U
11104-28-2	Aroclor-1221	ND	0.0653	0.248	U
11141-16-5	Aroclor-1232	ND	0.0831	0.248	U
53469-21-9	Aroclor-1242	ND	0.0486	0.248	U
12672-29-6	Aroclor-1248	ND	0.0509	0.248	U
11097-69-1	Aroclor-1254	1.75	0.0399	0.248	
11096-82-5	Aroclor-1260	ND	0.0310	0.248	U
37324-23-5	Aroclor-1262	ND	0.0666	0.248	U
11100-14-4	Aroclor-1268	ND	0.0299	0.248	U
1336-36-3	Total PCBs	1.75	0.0231	0.248	

ND, U - Indicates compound analyzed for but not detected
J - Indicates estimated value
B - Indicates compound found in associated blank
E - Concentration exceeds highest calibration standard
D - Indicates result is based on a dilution
H - Indicates a Hold Time violation
P - Greater than 25% diff. between 2 GC columns.
MDL - Minimum detection limit, **RL** - Reporting limit

Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200728\6B41860.D\ECD1A.CH Vial: 8
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200728\6B41860.D\ECD2B.CH
Acq On : 28 Jul 2020 14:22 Operator: RL
Sample : 0071061-02 Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Jul 28 14:57 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Initial Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um

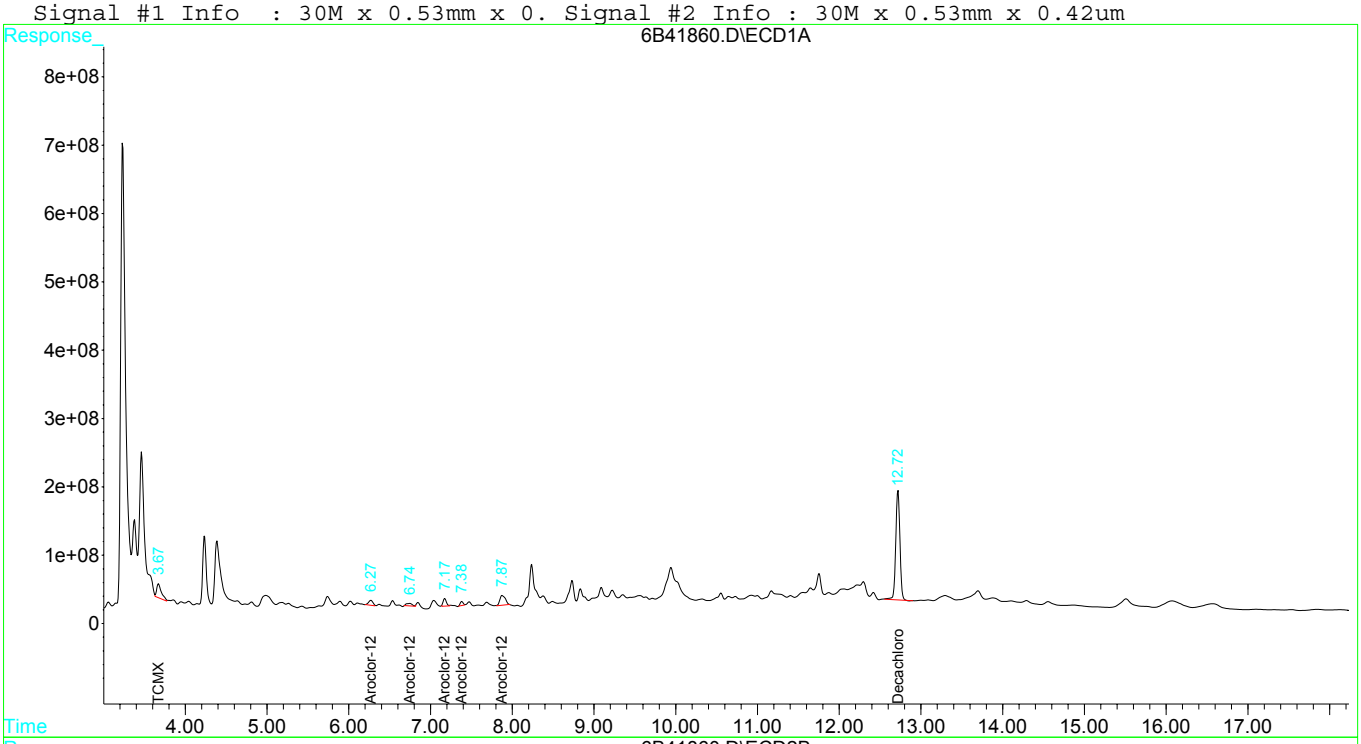
Compound	RT#1	RT#2	Resp#1	Resp#2	ug/kg	ug/kg
System Monitoring Compounds						
1) S TCMX	3.67	4.42f	824.5E6	417.1E6	53.253m	64.506m
Spiked Amount 50.000	Range 40 - 149		Recovery =		106.51%	129.01%
2) S Decachlorobiphen	12.72f	16.70f	5681.1E6	2710.4E6	363.247m	413.561
Spiked Amount 50.000	Range 52 - 136		Recovery =		726.49%#	827.12%#
Target Compounds						
Sum Aroclor-1016 (1)			0	0	N.D.	N.D.
Average Aroclor-1016 (1)					0.000	0.000
Sum Aroclor-1221 (1)			0	0	N.D.	N.D.
Average Aroclor-1221 (1)					0.000	0.000
Sum Aroclor-1232 (1)			0	0	N.D.	N.D.
Average Aroclor-1232 (1)					0.000	0.000
Sum Aroclor-1242 (1)			0	0	N.D.	N.D.
Average Aroclor-1242 (1)					0.000	0.000
Sum Aroclor-1248 (1)			0	0	N.D.	N.D.
Average Aroclor-1248 (1)					0.000	0.000
30) L8 Aroclor-1254 (1)	6.27f	8.14f	267.0E6	41436102	432.578m	173.474m#
31) L8 Aroclor-1254 (2)	6.74	8.49	175.5E6	39073333	116.081m	128.646m
32) L8 Aroclor-1254 (3)	7.17f	9.15f	313.2E6	55413234	512.427m	248.105m#
33) L8 Aroclor-1254 (4)	7.38f	9.38f	144.2E6	78484699	118.159m	160.816m#
34) L8 Aroclor-1254 (5)	7.87	9.81f	670.1E6	78917375	569.644m	181.614m#
Sum Aroclor-1254 (1)			1570.1E6	293.3E6	1748.889	892.655
Average Aroclor-1254 (1)					349.778	178.531
Sum Aroclor-1260 (1)			0	0	N.D.	N.D.
Average Aroclor-1260 (1)					0.000	0.000
Sum Aroclor-1262 (1)			0	0	N.D.	N.D.
Average Aroclor-1262 (1)					0.000	0.000
Sum Aroclor-1268 (1)			0	0	N.D.	N.D.
Average Aroclor-1268 (1)					0.000	0.000

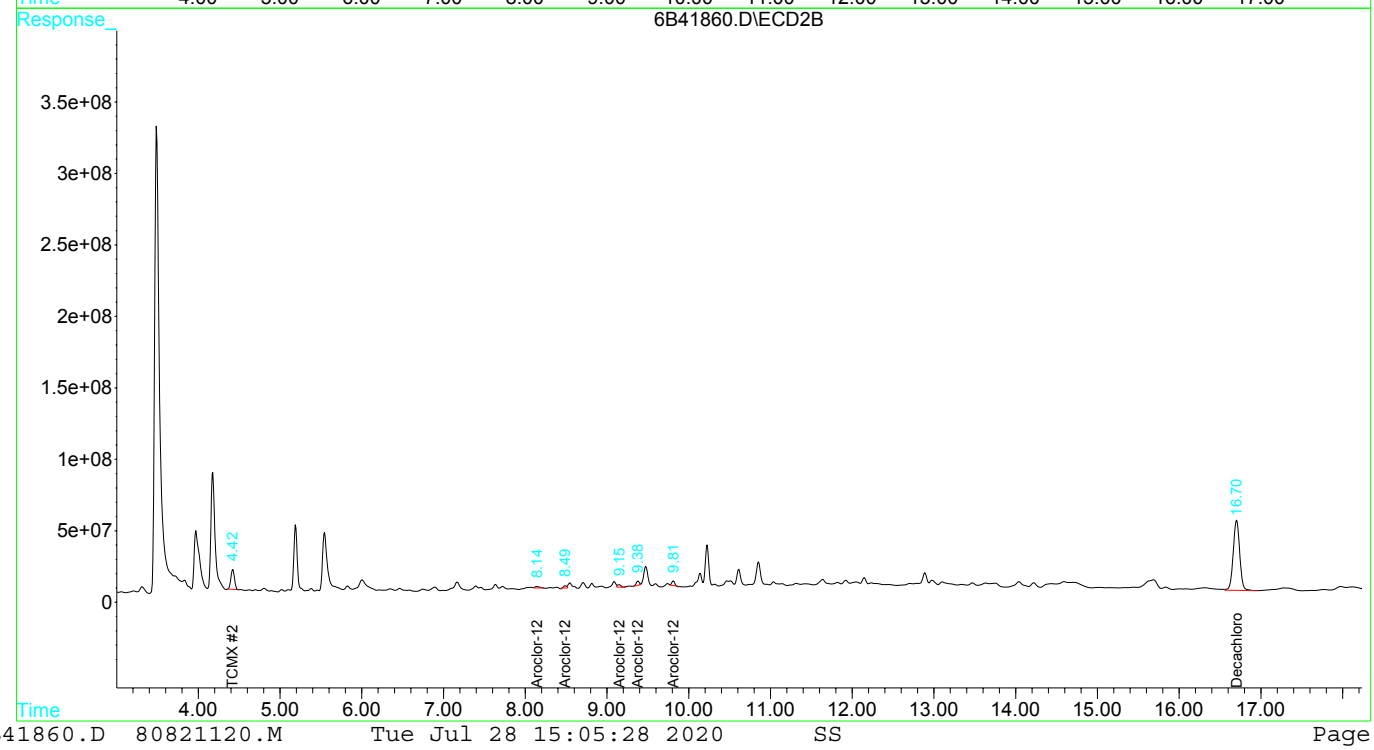
Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200728\6B41860.D\ECD1A.CH Vial: 8
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200728\6B41860.D\ECD2B.CH
Acq On : 28 Jul 2020 14:22 Operator: RL
Sample : 0071061-02 Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Jul 28 14:57 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Multiple Level Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um





SURROGATE RECOVERIES

Analysis Class: PCBs

Matrix: Soil **Method:** SW 846 8082A

PCBs

Lab Number	File ID	TCMX	DCB	TCMX[2C]	DCB[2C]
0071061-01	6B41861.D	55.0	187 *	76.2	87.1
0071061-02	6B41860.D	106	726 *	129	827 *
B0G1671-BLK1	6B42409.D	103	84.6	103	82.7
B0G1671-BS1	6B42410.D	102	77.1	100	74.5
B0G1671-MS1	6B42270.D	134	122	100	97.4
B0G1671-MSD1	6B42267.D	101	380 *	98.0	331 *

Surrogate Limits

Acronym	Lo Limit	Hi Limit	Analyte
TCMX	40.2	149	Tetrachloro-m-xylene
DCB	52.1	136	Decachlorobiphenyl
TCMX[2C]	40.2	149	Tetrachloro-m-xylene [2C]
DCB[2C]	52.1	136	Decachlorobiphenyl [2C]

* - Outside of QC Limits

Batch B0G1671 **Method: SW 846 8082A** **Prepared: 07/30/2020**

B0G1671-BS1 **Source:**

Analyte	Result	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Aroclor-1016	0.347	mg/kg wet	0.333		104	70-130		
Aroclor-1260	0.294	mg/kg wet	0.333		88.2	70-130		

Batch B0G1671 (cont.) **Method: SW 846 8082A** **Prepared: 07/30/2020**

B0G1671-MS1 **Source:** 0071061-01

Analyte	Result	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Aroclor-1016	6.18	mg/kg dry	3.47	ND	178*	60-140		
Aroclor-1260	8.13	mg/kg dry	3.47	ND	234*	60-140		

Batch B0G1671 (cont.) **Method: SW 846 8082A** **Prepared: 07/30/2020**

B0G1671-MSD1 **Source:** 0071061-01

Analyte	Result	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Aroclor-1016	6.30	mg/kg dry	3.47	ND	181*	60-140	1.89	30
Aroclor-1260	6.43	mg/kg dry	3.47	ND	185*	60-140	23.4	30

* - Outside of QC Limits J - Result is between the MDL and RL for an Analysis reported to an RL

NC - Outside the recovery criteria but Spike Amount <1/4 amount found in Source Sample

METHOD BLANK SUMMARY

Batch ID: **B0G1671**

Lab Number	Sample Id	Extraction Date	Analysis Date
0071061-01	FR-PCB-01	07/24/2020	07/28/2020 14:43
0071061-02	FR-PCB-02	07/24/2020	07/28/2020 14:22

Lab Number	Sample Id	Extraction Date	Analysis Date
B0G1671-BLK1	BLK1	07/30/2020	08/17/2020 10:24
B0G1671-BS1	BS1	07/30/2020	08/17/2020 10:45
B0G1671-MS1	MS1	07/30/2020	08/11/2020 13:57
B0G1671-MSD1	MSD1	07/30/2020	08/11/2020 12:51

SURROGATE RT DRIFT REPORT

Analysis Class: PCBs

Sequence : S0G2815

		TCMX			DCB			TCMX[2C]			DCB[2C]		
Lab Number	File ID	RT	Ref RT	Drift	RT	Ref RT	Drift	RT	Ref RT	Drift	RT	Ref RT	Drift
0071061-02	6B41860.D	3.67	3.68	-0.01	12.72	12.75	-0.03	4.42	4.43	-0.01	16.7	16.72	-0.02
0071061-01	6B41861.D	3.66	3.68	-0.02	12.72	12.75	-0.03	4.43	4.43	0.00	16.7	16.72	-0.02

Sequence : S0H1106

		TCMX			DCB			TCMX[2C]			DCB[2C]		
Lab Number	File ID	RT	Ref RT	Drift	RT	Ref RT	Drift	RT	Ref RT	Drift	RT	Ref RT	Drift
B0G1671-MSD1	6B42267.D	3.67	3.68	-0.01	12.71	12.74	-0.03	4.43	4.43	0.00	16.69	16.7	-0.01
B0G1671-MS1	6B42270.D	3.67	3.68	-0.01	12.71	12.74	-0.03	4.43	4.43	0.00	16.69	16.7	-0.01

Sequence : S0H1704

		TCMX			DCB			TCMX[2C]			DCB[2C]		
Lab Number	File ID	RT	Ref RT	Drift	RT	Ref RT	Drift	RT	Ref RT	Drift	RT	Ref RT	Drift
B0G1671-BLK1	6B42409.D	3.68	3.68	0.00	12.74	12.73	0.01	4.43	4.42	0.01	16.7	16.69	0.01
B0G1671-BS1	6B42410.D	3.68	3.68	0.00	12.72	12.73	-0.01	4.43	4.42	0.01	16.7	16.69	0.01

Surrogate		Limit
TCMX	Tetrachloro-m-xylene	0.10
DCB	Decachlorobiphenyl	0.10
TCMX[2C]	Tetrachloro-m-xylene [2C]	0.10
DCB[2C]	Decachlorobiphenyl [2C]	0.10

DISS = Dissolved Analysis

Response Factor Report HP G1530A

Method : G:\HPCHEM\GCECD6\METHODS\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A
Last Update : Thu Nov 21 12:40:17 2019

Calibration Files
50 =6B35897.D 250 =6B35898.D 500 =6B35899.D
1000 =6B35900.D 2000 =6B35901.D 3000 =6B35902.D

		Compound	50	250	500	1000	2000	3000	Avg		%RSD
1)	S	TCMX	1.404	1.442	1.633	1.603	1.646	1.562	1.548	E7	6.59
2)	S	Decachlorobiphenyl		1.547	1.549	1.569	1.590	1.565	1.564	E7	1.12
3)	L3	Aroclor-1016 (1)	3.174	3.146	3.390	3.244	3.185	2.966	3.184	E5	4.33
4)	L3	Aroclor-1016 (2)	6.339	5.803	6.188	5.631	5.428	5.128	5.753	E5	7.95
5)	L3	Aroclor-1016 (3)	1.453	1.441	1.505	1.437	1.415	1.358	1.435	E6	3.34
6)	L3	Aroclor-1016 (4)	5.674	5.524	5.786	5.461	5.337	5.101	5.480	E5	4.45
7)	L3	Aroclor-1016 (5)	5.517	5.380	5.664	5.362	5.243	5.054	5.370	E5	3.94
8)	L4	Aroclor-1221 (1)				8.915		7.985	8.450	E4	7.78
9)	L4	Aroclor-1221 (2)				1.531		1.675	1.603	E5	6.38
10)	L4	Aroclor-1221 (3)				4.757		4.869	4.813	E5	1.65
11)	L4	Aroclor-1221 (4)				4.910		5.315	5.112	E4	5.59
12)	L4	Aroclor-1221 (5)				5.634		5.465	5.550	E4	2.16
13)	L5	Aroclor-1232 (1)				4.170		3.709	3.940	E5	8.28
14)	L5	Aroclor-1232 (2)				2.926		2.574	2.750	E5	9.05
15)	L5	Aroclor-1232 (3)				6.361		6.052	6.207	E5	3.52
16)	L5	Aroclor-1232 (4)				2.504		2.303	2.404	E5	5.92
17)	L5	Aroclor-1232 (5)				2.361		2.147	2.254	E5	6.69
18)	L6	Aroclor-1242 (1)				4.454		4.221	4.338	E5	3.81
19)	L6	Aroclor-1242 (2)				1.134		1.089	1.111	E6	2.81
20)	L6	Aroclor-1242 (3)				4.313		4.152	4.233	E5	2.69
21)	L6	Aroclor-1242 (4)				4.410		4.227	4.318	E5	2.99
22)	L6	Aroclor-1242 (5)				4.023		3.677	3.850	E5	6.34
23)	L7	Aroclor-1248 (1)				2.252		2.212	2.232	E5	1.26
24)	L7	Aroclor-1248 (2)				7.467		7.267	7.367	E5	1.93
25)	L7	Aroclor-1248 (3)				9.583		9.187	9.385	E5	2.98
26)	L7	Aroclor-1248 (4)				6.634		6.384	6.509	E5	2.71
27)	L7	Aroclor-1248 (5)				6.246		6.057	6.152	E5	2.16
28)	L7	Aroclor-1248 (6)				1.285		1.221	1.253	E6	3.63
29)	L7	Aroclor-1248 (7)				1.096		1.074	1.085	E6	1.43
30)	L8	Aroclor-1254 (1)				6.036		6.309	6.172	E5	3.13
31)	L8	Aroclor-1254 (2)				1.485		1.538	1.512	E6	2.47
32)	L8	Aroclor-1254 (3)				5.966		6.259	6.112	E5	3.40
33)	L8	Aroclor-1254 (4)				1.193		1.248	1.220	E6	3.19
34)	L8	Aroclor-1254 (5)				1.182		1.170	1.176	E6	0.71
35)	L8	Aroclor-1254 (6)				9.299		9.827	9.563	E5	3.90
36)	L8	Aroclor-1254 (7)				1.248		1.326	1.287	E6	4.25
37)	L9	Aroclor-1260 (1)	1.604	1.565	1.615	1.630	1.657	1.621	1.615	E6	1.88
38)	L9	Aroclor-1260 (2)	1.219	1.142	1.248	1.213	1.228	1.205	1.209	E6	3.00
39)	L9	Aroclor-1260 (3)	9.780	8.579	9.578	9.304	9.650	9.446	9.390	E5	4.58
40)	L9	Aroclor-1260 (4)	2.670	2.447	2.675	2.656	2.676	2.625	2.625	E6	3.40
41)	L9	Aroclor-1260 (5)	2.283	2.223	2.331	2.244	2.307	2.295	2.280	E6	1.77
42)	L1	Aroclor-1262 (1)				1.215		1.256	1.236	E6	2.32
43)	L1	Aroclor-1262 (2)				1.790		1.801	1.796	E6	0.42
44)	L1	Aroclor-1262 (3)				1.257		1.238	1.247	E6	1.04
45)	L1	Aroclor-1262 (4)				3.076		3.098	3.087	E6	0.52
46)	L1	Aroclor-1262 (5)				2.995		3.098	3.047	E6	2.39
47)	L2	Aroclor-1268 (1)				3.401		3.368	3.384	E6	0.69
48)	L2	Aroclor-1268 (2)				2.767		2.754	2.760	E6	0.34
49)	L2	Aroclor-1268 (3)				2.424		2.436	2.430	E6	0.35
50)	L2	Aroclor-1268 (4)				1.067		1.026	1.046	E6	2.72
51)	L2	Aroclor-1268 (5)				6.729		6.466	6.597	E6	2.83

Signal #2 Calibration Files
50 =6B35897.D 250 =6B35898.D 500 =6B35899.D
1000 =6B35900.D 2000 =6B35901.D 3000 =6B35902.D

		Compound	50	250	500	1000	2000	3000	Avg		%RSD
1)	S	TCMX	6.276	6.047	6.548	6.558	6.788	6.579	6.466	E6	4.05
2)	S	Decachlorobiphenyl		6.433	6.766	6.389	6.646	6.535	6.554	E6	2.36
3)	L3	Aroclor-1016 (1)	1.111	1.064	1.102	1.009	1.030	1.003	1.053	E5	4.43

(#) = Out of Range

Response Factor Report HP G1530A

Method : G:\HPCHEM\GCECD6\METHODS\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A
Last Update : Thu Nov 21 12:40:17 2019

Calibration Files
50 =6B35897.D 250 =6B35898.D 500 =6B35899.D
1000 =6B35900.D 2000 =6B35901.D 3000 =6B35902.D

		Compound	50	250	500	1000	2000	3000	Avg		%RSD
4)	L3	Aroclor-1016 (2)	2.690	2.401	2.305	2.192	2.180	2.186	2.326	E5	8.54
5)	L3	Aroclor-1016 (3)	5.408	5.275	5.420	5.242	5.341	5.175	5.310	E5	1.82
6)	L3	Aroclor-1016 (4)	2.068	2.089	2.180	2.089	2.091	2.012	2.088	E5	2.60
7)	L3	Aroclor-1016 (5)	1.596	1.549	1.643	1.583	1.582	1.520	1.579	E5	2.66
8)	L4	Aroclor-1221 (1)				3.965		3.511	3.738	E4	8.57
9)	L4	Aroclor-1221 (2)				6.368		6.274	6.321	E4	1.05
10)	L4	Aroclor-1221 (3)				1.596		1.578	1.587	E5	0.80
11)	L4	Aroclor-1221 (4)				3.164		3.052	3.108	E4	2.53
12)	L4	Aroclor-1221 (5)				1.948		1.874	1.911	E4	2.73
13)	L5	Aroclor-1232 (1)				1.253		1.229	1.241	E5	1.40
14)	L5	Aroclor-1232 (2)				1.011		0.967	0.989	E5	3.19
15)	L5	Aroclor-1232 (3)				2.247		2.222	2.234	E5	0.80
16)	L5	Aroclor-1232 (4)				9.058		8.890	8.974	E4	1.32
17)	L5	Aroclor-1232 (5)				6.293		6.230	6.262	E4	0.71
18)	L6	Aroclor-1242 (1)				1.736		1.695	1.716	E5	1.68
19)	L6	Aroclor-1242 (2)				4.115		4.149	4.132	E5	0.58
20)	L6	Aroclor-1242 (3)				1.642		1.627	1.635	E5	0.67
21)	L6	Aroclor-1242 (4)				1.268		1.256	1.262	E5	0.66
22)	L6	Aroclor-1242 (5)				1.688		1.623	1.656	E5	2.79
23)	L7	Aroclor-1248 (1)				9.187		8.635	8.911	E4	4.38
24)	L7	Aroclor-1248 (2)				2.636		2.589	2.613	E5	1.27
25)	L7	Aroclor-1248 (3)				1.492		1.445	1.469	E5	2.25
26)	L7	Aroclor-1248 (4)				1.986		1.972	1.979	E5	0.49
27)	L7	Aroclor-1248 (5)				2.223		2.206	2.214	E5	0.55
28)	L7	Aroclor-1248 (6)				2.786		2.751	2.768	E5	0.89
29)	L7	Aroclor-1248 (7)				2.696		2.695	2.695	E5	0.02
30)	L8	Aroclor-1254 (1)				2.347		2.430	2.389	E5	2.45
31)	L8	Aroclor-1254 (2)				2.958		3.116	3.037	E5	3.67
32)	L8	Aroclor-1254 (3)				2.176		2.291	2.233	E5	3.63
33)	L8	Aroclor-1254 (4)				4.735		5.025	4.880	E5	4.20
34)	L8	Aroclor-1254 (5)				4.207		4.484	4.345	E5	4.51
35)	L8	Aroclor-1254 (6)				2.712		2.845	2.779	E5	3.37
36)	L8	Aroclor-1254 (7)				4.707		5.083	4.895	E5	5.44
37)	L9	Aroclor-1260 (1)	6.729	6.037	6.295	6.124	6.288	6.220	6.282	E5	3.83
38)	L9	Aroclor-1260 (2)	3.839	3.960	4.307	4.296	4.456	4.545	4.234	E5	6.56
39)	L9	Aroclor-1260 (3)	4.284	4.085	4.013	3.837	3.896	3.832	3.991	E5	4.39
40)	L9	Aroclor-1260 (4)	9.074	9.122	9.715	9.581	9.956	9.839	9.548	E5	3.88
41)	L9	Aroclor-1260 (5)	9.119	8.304	9.008	8.640	8.762	8.730	8.760	E5	3.29
42)	L1	Aroclor-1262 (1)				4.424		4.514	4.469	E5	1.42
43)	L1	Aroclor-1262 (2)				6.558		6.906	6.732	E5	3.66
44)	L1	Aroclor-1262 (3)				4.735		4.878	4.807	E5	2.10
45)	L1	Aroclor-1262 (4)				1.091		1.138	1.114	E6	2.99
46)	L1	Aroclor-1262 (5)				1.116		1.162	1.139	E6	2.89
47)	L2	Aroclor-1268 (1)				1.278		1.333	1.305	E6	2.96
48)	L2	Aroclor-1268 (2)				1.048		1.108	1.078	E6	3.96
49)	L2	Aroclor-1268 (3)				9.192		9.755	9.473	E5	4.20
50)	L2	Aroclor-1268 (4)				3.737		3.919	3.828	E5	3.36
51)	L2	Aroclor-1268 (5)				2.834		2.903	2.869	E6	1.69

(#) = Out of Range

Compound List Report HP G1530A

Method : G:\HPCHEM\GCECD6\METHODS\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A
Last Update : Thu Nov 21 12:40:17 2019
Response via : Initial Calibration
Total Cpnds : 103

PK#	Type	Compound Name	Exp_RT	Rel_RT	Cal	A/H	ID
1	S	TCMX	3.68	1.000	A	A	B
2	S	Decachlorobiphenyl	12.76	1.000	A	A	B
3	L3	Aroclor-1016 (1)	4.01	1.000	A	A	B
4	L3	Aroclor-1016 (2)	4.41	1.000	A	A	B
5	L3	Aroclor-1016 (3)	4.99	1.000	A	A	B
6	L3	Aroclor-1016 (4)	5.17	1.000	A	A	B
7	L3	Aroclor-1016 (5)	5.74	1.000	A	A	B
8	L4	Aroclor-1221 (1)	3.18	1.000	A	A	B
9	L4	Aroclor-1221 (2)	3.81	1.000	A	A	B
10	L4	Aroclor-1221 (3)	4.01	1.000	A	A	B
11	L4	Aroclor-1221 (4)	4.41	1.000	A	A	B
12	L4	Aroclor-1221 (5)	4.57	1.000	A	A	B
13	L5	Aroclor-1232 (1)	4.01	1.000	A	A	B
14	L5	Aroclor-1232 (2)	4.41	1.000	A	A	B
15	L5	Aroclor-1232 (3)	4.98	1.000	A	A	B
16	L5	Aroclor-1232 (4)	5.17	1.000	A	A	B
17	L5	Aroclor-1232 (5)	5.74	1.000	A	A	B
18	L6	Aroclor-1242 (1)	4.41	1.000	A	A	B
19	L6	Aroclor-1242 (2)	4.98	1.000	A	A	B
20	L6	Aroclor-1242 (3)	5.17	1.000	A	A	B
21	L6	Aroclor-1242 (4)	5.74	1.000	A	A	B
22	L6	Aroclor-1242 (5)	6.43	1.000	A	A	B
23	L7	Aroclor-1248 (1)	4.41	1.000	A	A	B
24	L7	Aroclor-1248 (2)	4.98	1.000	A	A	B
25	L7	Aroclor-1248 (3)	5.43	1.000	A	A	B
26	L7	Aroclor-1248 (4)	5.75	1.000	A	A	B
27	L7	Aroclor-1248 (5)	5.87	1.000	A	A	B
28	L7	Aroclor-1248 (6)	6.39	1.000	A	A	B
29	L7	Aroclor-1248 (7)	6.71	1.000	A	A	B
30	L8	Aroclor-1254 (1)	6.31	1.000	A	A	B
31	L8	Aroclor-1254 (2)	6.72	1.000	A	A	B
32	L8	Aroclor-1254 (3)	7.18	1.000	A	A	B
33	L8	Aroclor-1254 (4)	7.40	1.000	A	A	B
34	L8	Aroclor-1254 (5)	7.88	1.000	A	A	B
35	L8	Aroclor-1254 (6)	8.20	1.000	A	A	B
36	L8	Aroclor-1254 (7)	8.71	1.000	A	A	B
37	L9	Aroclor-1260 (1)	8.71	1.000	A	A	B
38	L9	Aroclor-1260 (2)	8.91	1.000	A	A	B
39	L9	Aroclor-1260 (3)	9.38	1.000	A	A	B
40	L9	Aroclor-1260 (4)	9.96	1.000	A	A	B
41	L9	Aroclor-1260 (5)	10.53	1.000	A	A	B
42	L1	Aroclor-1262 (1)	8.19	1.000	A	A	B
43	L1	Aroclor-1262 (2)	8.91	1.000	A	A	B
44	L1	Aroclor-1262 (3)	9.37	1.000	A	A	B
45	L1	Aroclor-1262 (4)	9.97	1.000	A	A	B
46	L1	Aroclor-1262 (5)	10.57	1.000	A	A	B
47	L2	Aroclor-1268 (1)	10.58	1.000	A	A	B
48	L2	Aroclor-1268 (2)	10.66	1.000	A	A	B
49	L2	Aroclor-1268 (3)	11.04	1.000	A	A	B
50	L2	Aroclor-1268 (4)	11.74	1.000	A	A	B
51	L2	Aroclor-1268 (5)	12.33	1.000	A	A	B
52		Signal #2	34.78	1.000	A	A	B
53	S	TCMX #2	4.43	1.000	A	A	B
54	S	Decachlorobiphenyl #2	16.77	1.000	A	A	B
55	L3	Aroclor-1016 (1) #2	5.05	1.000	A	A	B
56	L3	Aroclor-1016 (2) #2	5.65	1.000	A	A	B
57	L3	Aroclor-1016 (3) #2	6.38	1.000	A	A	B
58	L3	Aroclor-1016 (4) #2	6.61	1.000	A	A	B
59	L3	Aroclor-1016 (5) #2	7.41	1.000	A	A	B
60	L4	Aroclor-1221 (1) #2	3.85	1.000	A	A	B
61	L4	Aroclor-1221 (2) #2	4.77	1.000	A	A	B
62	L4	Aroclor-1221 (3) #2	5.05	1.000	A	A	B
63	L4	Aroclor-1221 (4) #2	5.64	1.000	A	A	B
64	L4	Aroclor-1221 (5) #2	5.74	1.000	A	A	B
65	L5	Aroclor-1232 (1) #2	5.05	1.000	A	A	B
66	L5	Aroclor-1232 (2) #2	5.65	1.000	A	A	B

67	L5	Aroclor-1232 (3) #2	6.38	1.000	A	A	B
68	L5	Aroclor-1232 (4) #2	6.61	1.000	A	A	B
69	L5	Aroclor-1232 (5) #2	7.41	1.000	A	A	B
70	L6	Aroclor-1242 (1) #2	5.65	1.000	A	A	B
71	L6	Aroclor-1242 (2) #2	6.38	1.000	A	A	B
72	L6	Aroclor-1242 (3) #2	6.61	1.000	A	A	B
73	L6	Aroclor-1242 (4) #2	7.41	1.000	A	A	B
74	L6	Aroclor-1242 (5) #2	8.18	1.000	A	A	B
75	L7	Aroclor-1248 (1) #2	5.65	1.000	A	A	B
76	L7	Aroclor-1248 (2) #2	6.38	1.000	A	A	B
77	L7	Aroclor-1248 (3) #2	6.92	1.000	A	A	B
78	L7	Aroclor-1248 (4) #2	7.41	1.000	A	A	B
79	L7	Aroclor-1248 (5) #2	7.64	1.000	A	A	B
80	L7	Aroclor-1248 (6) #2	8.18	1.000	A	A	B
81	L7	Aroclor-1248 (7) #2	8.62	1.000	A	A	B
82	L8	Aroclor-1254 (1) #2	8.17	1.000	A	A	B
83	L8	Aroclor-1254 (2) #2	8.50	1.000	A	A	B
84	L8	Aroclor-1254 (3) #2	9.18	1.000	A	A	B
85	L8	Aroclor-1254 (4) #2	9.40	1.000	A	A	B
86	L8	Aroclor-1254 (5) #2	9.83	1.000	A	A	B
87	L8	Aroclor-1254 (6) #2	10.17	1.000	A	A	B
88	L8	Aroclor-1254 (7) #2	10.90	1.000	A	A	B
89	L9	Aroclor-1260 (1) #2	10.89	1.000	A	A	B
90	L9	Aroclor-1260 (2) #2	11.07	1.000	A	A	B
91	L9	Aroclor-1260 (3) #2	11.67	1.000	A	A	B
92	L9	Aroclor-1260 (4) #2	12.18	1.000	A	A	B
93	L9	Aroclor-1260 (5) #2	13.03	1.000	A	A	B
94	L1	Aroclor-1262 (1) #2	10.17	1.000	A	A	B
95	L1	Aroclor-1262 (2) #2	11.07	1.000	A	A	B
96	L1	Aroclor-1262 (3) #2	11.67	1.000	A	A	B
97	L1	Aroclor-1262 (4) #2	12.18	1.000	A	A	B
98	L1	Aroclor-1262 (5) #2	13.01	1.000	A	A	B
99	L2	Aroclor-1268 (1) #2	13.01	1.000	A	A	B
100	L2	Aroclor-1268 (2) #2	13.13	1.000	A	A	B
101	L2	Aroclor-1268 (3) #2	13.81	1.000	A	A	B
102	L2	Aroclor-1268 (4) #2	14.63	1.000	A	A	B
103	L2	Aroclor-1268 (5) #2	15.75	1.000	A	A	B

Cal A = Average L = Linear LO = Linear w/origin Q = Quad QO = Quad w/origin
A/H = Area or Height
ID R = R.T. B = R.T. & Q Q = Qvalue L = Largest A = All

80821120.M Tue Nov 26 15:00:55 2019 SS

CALIBRATION VERIFICATION SUMMARY

Client: **Bidwell Environmental**
Work Order: **0071061**

Lab Sample ID (X500):	S0G2815-CCV1(1)	Init. Calib. Date(s):	11/20/2019
File ID:	6B41852.D	Date Analyzed:	07/28/2020 06:55
PCBs	Column 1	Matrix:	Soil

Individual Mix Compound		RT WINDOW		$\overline{CF}$	CF	%D
		FROM	TO			
Average-Aroclor-1016	-----	-----	-----	682691	687589	0.70
Aroclor-1016 (1)	04.02	03.92	04.12	318421	304520	4.40
Aroclor-1016 (2)	04.42	04.32	04.52	575281	606956	5.50
Aroclor-1016 (3)	05.00	04.90	05.10	1434709	1459937	1.80
Aroclor-1016 (4)	05.19	05.09	05.29	548045	546617	0.30
Aroclor-1016 (5)	05.75	05.65	05.85	536998	519916	3.20
Average-Aroclor-1260	-----	-----	-----	1733755	1604674	7.40
Aroclor-1260 (1)	08.72	08.62	08.82	1615493	1378072	14.70
Aroclor-1260 (2)	08.92	08.82	09.02	1209241	1121378	7.30
Aroclor-1260 (3)	09.38	09.28	09.48	938972	851415	9.30
Aroclor-1260 (4)	09.97	09.87	10.07	2624633	2489068	5.20
Aroclor-1260 (5)	10.54	10.44	10.64	2280434	2183436	4.30
Tetrachloro-m-xylene	03.68	03.58	03.78	15482490	16466490	6.40
Decachlorobiphenyl	12.75	12.65	12.85	15639640	16718340	6.90

* - Outside of QC limits

CALIBRATION VERIFICATION SUMMARY

Client: **Bidwell Environmental**
Work Order: **0071061**

Lab Sample ID (X500):	S0G2815-CCV1(2)	Init. Calib. Date(s):	11/20/2019
File ID:	6B41852.D	Date Analyzed:	07/28/2020 06:55
PCBs	Column 2	Matrix:	Soil

Individual Mix Compound		RT WINDOW		$\overline{CF}$	CF	%D
		FROM	TO			
Average-Aroclor-1016 [2C]	-----	-----	-----	247115	243269	1.60
Aroclor-1016 (1) [2C]	05.04	04.94	05.14	105303	110374	4.80
Aroclor-1016 (2) [2C]	05.64	05.54	05.74	232565	210958	9.30
Aroclor-1016 (3) [2C]	06.37	06.27	06.47	531001	530261	0.10
Aroclor-1016 (4) [2C]	06.60	06.50	06.70	208818	210609	0.90
Aroclor-1016 (5) [2C]	07.39	07.29	07.49	157889	154143	2.40
Average-Aroclor-1260 [2C]	-----	-----	-----	656312	588702	10.30
Aroclor-1260 (1) [2C]	10.88	10.78	10.98	628204	564723	10.10
Aroclor-1260 (2) [2C]	11.05	10.95	11.15	423408	381345	9.90
Aroclor-1260 (3) [2C]	11.65	11.55	11.75	399120	332111	16.80
Aroclor-1260 (4) [2C]	12.16	12.06	12.26	954785	877326	8.10
Aroclor-1260 (5) [2C]	13.00	12.90	13.10	876045	788003	10.00
Tetrachloro-m-xylene [2C]	04.43	04.33	04.53	6465871	6867418	6.20
Decachlorobiphenyl [2C]	16.72	16.62	16.82	6553783	6682650	2.00

* - Outside of QC limits

Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200728\6B41852.D\ECD1A.CH Vial: 96
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200728\6B41852.D\ECD2B.CH
Acq On : 28 Jul 2020 6:55 Operator: RL
Sample : SEQ-CCV Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Jul 28 9:05 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Initial Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um

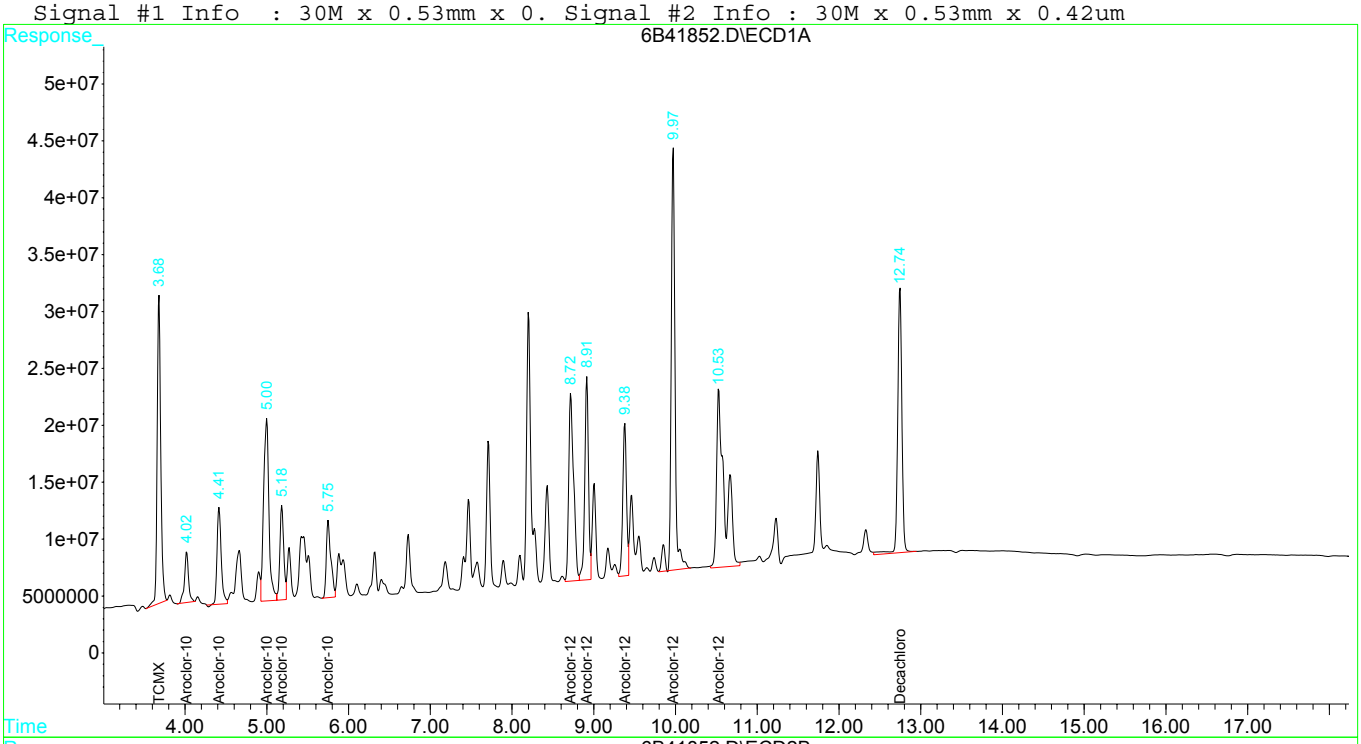
Compound	RT#1	RT#2	Resp#1	Resp#2	ug/kg	ug/kg
System Monitoring Compounds						
1) S TCMX	3.68	4.43	823.3E6	343.4E6	53.178	53.105
Spiked Amount 50.000	Range 40 - 149		Recovery =		106.36%	106.21%
2) S Decachlorobiphen	12.75	16.72	835.9E6	334.1E6	53.449	50.983
Spiked Amount 50.000	Range 52 - 136		Recovery =		106.90%	101.97%
Target Compounds						
3) L3 Aroclor-1016 (1)	4.02	5.04	152.3E6	55186850	478.172	524.075
4) L3 Aroclor-1016 (2)	4.42	5.64	303.5E6	105.5E6	527.530	453.547
5) L3 Aroclor-1016 (3)	5.00	6.37	730.0E6	265.1E6	508.792	499.303
6) L3 Aroclor-1016 (4)	5.19	6.60	273.3E6	105.3E6	498.697	504.288
7) L3 Aroclor-1016 (5)	5.75	7.39	260.0E6	77071552	484.095	488.139
Sum Aroclor-1016 (1)			1719.0E6	608.2E6	2497.286	2469.352
Average Aroclor-1016 (1)					499.457	493.870
Sum Aroclor-1221 (1)			0	0	N.D.	N.D.
Average Aroclor-1221 (1)					0.000	0.000
Sum Aroclor-1232 (1)			0	0	N.D.	N.D.
Average Aroclor-1232 (1)					0.000	0.000
Sum Aroclor-1242 (1)			0	0	N.D.	N.D.
Average Aroclor-1242 (1)					0.000	0.000
Sum Aroclor-1248 (1)			0	0	N.D.	N.D.
Average Aroclor-1248 (1)					0.000	0.000
Sum Aroclor-1254 (1)			0	0	N.D.	N.D.
Average Aroclor-1254 (1)					0.000	0.000
37) L9 Aroclor-1260 (1)	8.72	10.88	689.0E6	282.4E6	426.518	449.474
38) L9 Aroclor-1260 (2)	8.92	11.05	560.7E6	190.7E6	463.670	450.328
39) L9 Aroclor-1260 (3)	9.38	11.65	425.7E6	166.1E6	453.377	416.054
40) L9 Aroclor-1260 (4)	9.97	12.16f	1244.5E6	438.7E6	474.175	459.436
41) L9 Aroclor-1260 (5)	10.54	13.00f	1091.7E6	394.0E6	478.733	449.750
Sum Aroclor-1260 (1)			4011.7E6	1471.8E6	2296.472	2225.043
Average Aroclor-1260 (1)					459.294	445.009
Sum Aroclor-1262 (1)			0	0	N.D.	N.D.
Average Aroclor-1262 (1)					0.000	0.000
Sum Aroclor-1268 (1)			0	0	N.D.	N.D.
Average Aroclor-1268 (1)					0.000	0.000

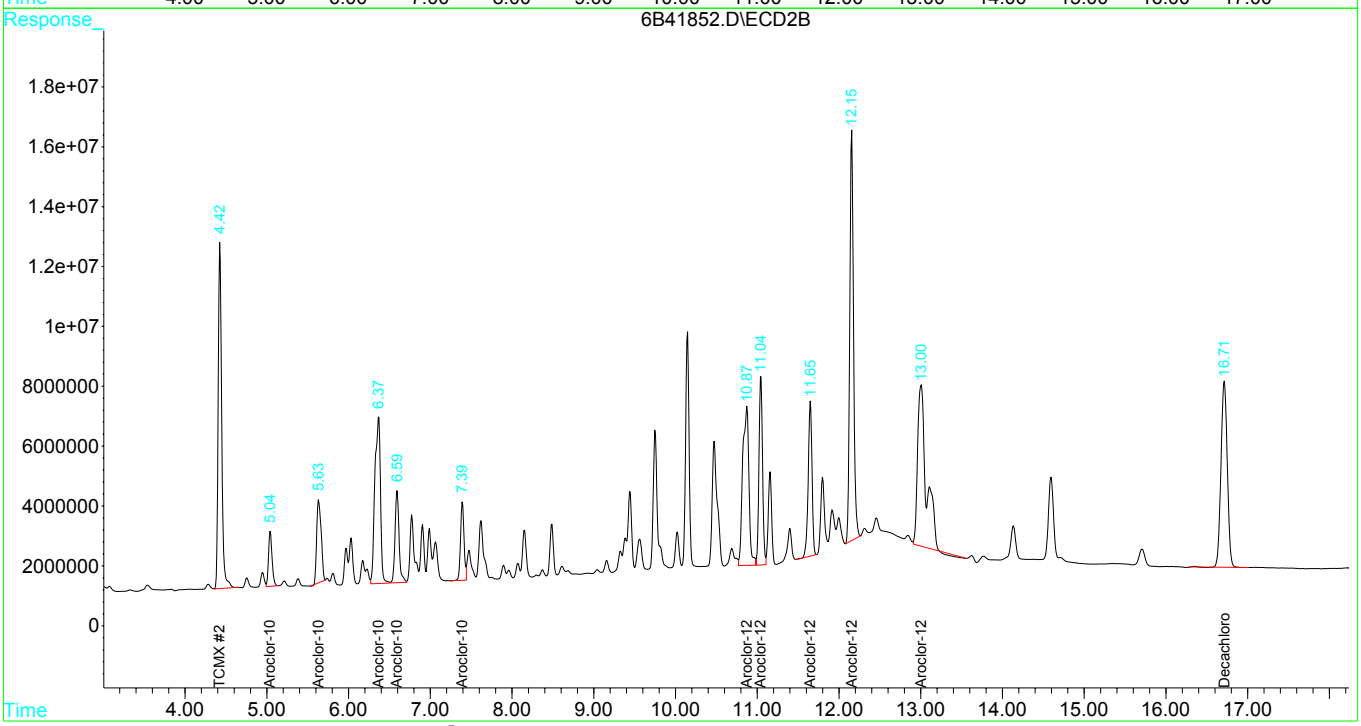
Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200728\6B41852.D\ECD1A.CH Vial: 96
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200728\6B41852.D\ECD2B.CH
Acq On : 28 Jul 2020 6:55 Operator: RL
Sample : SEQ-CCV Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Jul 28 9:05 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Multiple Level Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um





CALIBRATION VERIFICATION SUMMARY

Client: **Bidwell Environmental**
Work Order: **0071061**

Lab Sample ID (X500):	S0G2815-CCV2(1)	Init. Calib. Date(s):	11/20/2019
File ID:	6B41868.D	Date Analyzed:	07/29/2020 06:46
PCBs	Column 1	Matrix:	Soil

Individual Mix Compound		RT WINDOW		$\overline{CF}$	CF	%D
		FROM	TO			
Average-Aroclor-1016	-----	-----	-----	682691	671446	1.60
Aroclor-1016 (1)	04.02	03.92	04.12	318421	297982	6.40
Aroclor-1016 (2)	04.42	04.32	04.52	575281	587954	2.20
Aroclor-1016 (3)	05.00	04.90	05.10	1434709	1427607	0.50
Aroclor-1016 (4)	05.18	05.08	05.28	548045	537273	2.00
Aroclor-1016 (5)	05.75	05.65	05.85	536998	506416	5.70
Average-Aroclor-1260	-----	-----	-----	1733755	1763105	1.70
Aroclor-1260 (1)	08.72	08.62	08.82	1615493	1480464	8.40
Aroclor-1260 (2)	08.92	08.82	09.02	1209241	1036178	14.30
Aroclor-1260 (3)	09.38	09.28	09.48	938972	862192	8.20
Aroclor-1260 (4)	09.97	09.87	10.07	2624633	3090498	17.70
Aroclor-1260 (5)	10.52	10.42	10.62	2280434	2346194	2.90
Tetrachloro-m-xylene	03.68	03.58	03.78	15482490	16058040	3.70
Decachlorobiphenyl	12.75	12.65	12.85	15639640	17043490	9.00

* - Outside of QC limits

CALIBRATION VERIFICATION SUMMARY

Client: **Bidwell Environmental**
Work Order: **0071061**

Lab Sample ID (X500):	S0G2815-CCV2(2)	Init. Calib. Date(s):	11/20/2019
File ID:	6B41868.D	Date Analyzed:	07/29/2020 06:46
PCBs	Column 2	Matrix:	Soil

Individual Mix Compound		RT WINDOW		$\overline{CF}$	CF	%D
		FROM	TO			
Average-Aroclor-1016 [2C]	-----	-----	-----	247115	236068	4.50
Aroclor-1016 (1) [2C]	05.04	04.94	05.14	105303	107898	2.50
Aroclor-1016 (2) [2C]	05.63	05.53	05.73	232565	207082	11.00
Aroclor-1016 (3) [2C]	06.37	06.27	06.47	531001	516875	2.70
Aroclor-1016 (4) [2C]	06.59	06.49	06.69	208818	199860	4.30
Aroclor-1016 (5) [2C]	07.39	07.29	07.49	157889	148627	5.90
Average-Aroclor-1260 [2C]	-----	-----	-----	656312	631711	3.70
Aroclor-1260 (1) [2C]	10.87	10.77	10.97	628204	533003	15.20
Aroclor-1260 (2) [2C]	11.04	10.94	11.14	423408	371370	12.30
Aroclor-1260 (3) [2C]	11.65	11.55	11.75	399120	333504	16.40
Aroclor-1260 (4) [2C]	12.16	12.06	12.26	954785	919482	3.70
Aroclor-1260 (5) [2C]	13.00	12.90	13.10	876045	1001195	14.30
Tetrachloro-m-xylene [2C]	04.43	04.33	04.53	6465871	6696624	3.60
Decachlorobiphenyl [2C]	16.71	16.61	16.81	6553783	6526532	0.40

* - Outside of QC limits

Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200728\6B41868.D\ECD1A.CH Vial: 96
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200728\6B41868.D\ECD2B.CH
Acq On : 29 Jul 2020 6:46 Operator: RL
Sample : SEQ-CCV Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Jul 29 9:47 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Initial Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um

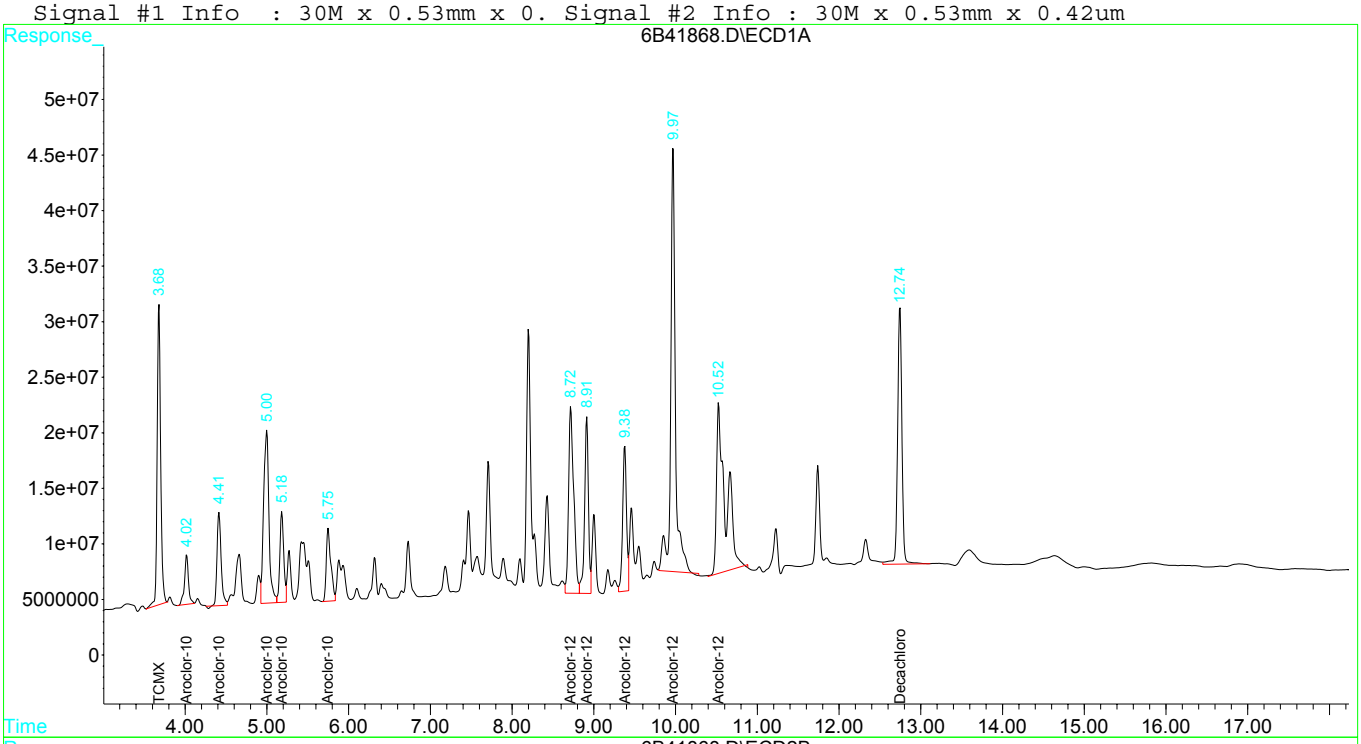
Compound	RT#1	RT#2	Resp#1	Resp#2	ug/kg	ug/kg
System Monitoring Compounds						
1) S TCMX	3.68	4.43	802.9E6	334.8E6	51.859	51.784
Spiked Amount 50.000	Range 40 - 149		Recovery =		103.72%	103.57%
2) S Decachlorobiphen	12.75	16.71f	852.2E6	326.3E6	54.488	49.792
Spiked Amount 50.000	Range 52 - 136		Recovery =		108.98%	99.58%
Target Compounds						
3) L3 Aroclor-1016 (1)	4.02	5.04	149.0E6	53948810	467.905	512.318
4) L3 Aroclor-1016 (2)	4.42	5.63	294.0E6	103.5E6	511.015	445.213
5) L3 Aroclor-1016 (3)	5.00	6.37	713.8E6	258.4E6	497.525	486.699
6) L3 Aroclor-1016 (4)	5.18	6.59	268.6E6	99929951	490.172	478.551
7) L3 Aroclor-1016 (5)	5.75	7.39	253.2E6	74313354	471.526	470.670
Sum Aroclor-1016 (1)			1678.6E6	590.2E6	2438.142	2393.451
Average Aroclor-1016 (1)					487.628	478.690
Sum Aroclor-1221 (1)			0	0	N.D.	N.D.
Average Aroclor-1221 (1)					0.000	0.000
Sum Aroclor-1232 (1)			0	0	N.D.	N.D.
Average Aroclor-1232 (1)					0.000	0.000
Sum Aroclor-1242 (1)			0	0	N.D.	N.D.
Average Aroclor-1242 (1)					0.000	0.000
Sum Aroclor-1248 (1)			0	0	N.D.	N.D.
Average Aroclor-1248 (1)					0.000	0.000
Sum Aroclor-1254 (1)			0	0	N.D.	N.D.
Average Aroclor-1254 (1)					0.000	0.000
37) L9 Aroclor-1260 (1)	8.72	10.87	740.2E6	266.5E6	458.208	424.228
38) L9 Aroclor-1260 (2)	8.92	11.04f	518.1E6	185.7E6	428.441	438.549
39) L9 Aroclor-1260 (3)	9.38	11.65f	431.1E6	166.8E6	459.115	417.799
40) L9 Aroclor-1260 (4)	9.97f	12.16f	1545.2E6	459.7E6	588.749m	481.513
41) L9 Aroclor-1260 (5)	10.52f	13.00f	1173.1E6	500.6E6	514.418m	571.429
Sum Aroclor-1260 (1)			4407.8E6	1579.3E6	2448.931	2333.517
Average Aroclor-1260 (1)					489.786	466.703
Sum Aroclor-1262 (1)			0	0	N.D.	N.D.
Average Aroclor-1262 (1)					0.000	0.000
Sum Aroclor-1268 (1)			0	0	N.D.	N.D.
Average Aroclor-1268 (1)					0.000	0.000

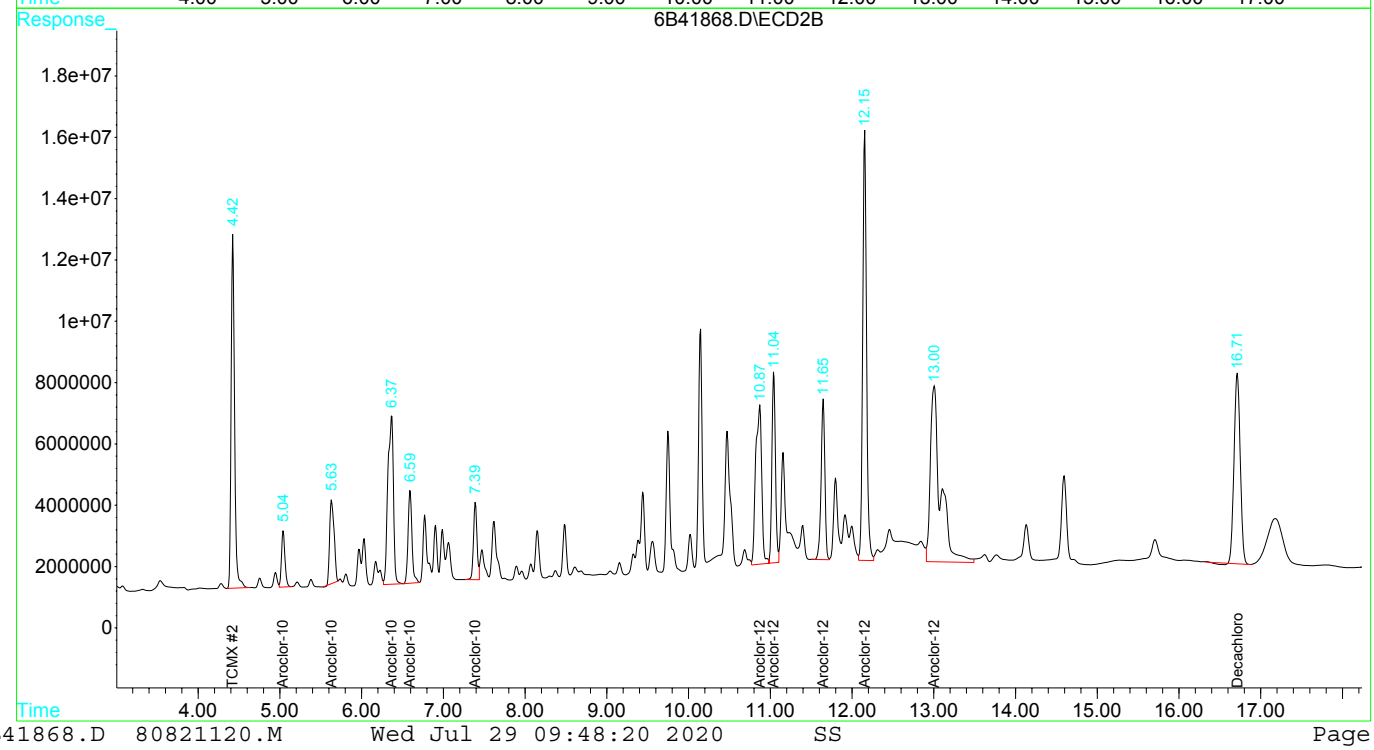
Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200728\6B41868.D\ECD1A.CH Vial: 96
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200728\6B41868.D\ECD2B.CH
Acq On : 29 Jul 2020 6:46 Operator: RL
Sample : SEQ-CCV Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Jul 29 9:47 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Multiple Level Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um





CALIBRATION VERIFICATION SUMMARY

Client: **Bidwell Environmental**
Work Order: **0071061**

Lab Sample ID (X500):	S0H1106-CCV1(1)	Init. Calib. Date(s):	11/20/2019
File ID:	6B42253.D	Date Analyzed:	08/11/2020 07:51
PCBs	Column 1	Matrix:	Soil

Individual Mix Compound		RT WINDOW		$\overline{CF}$	CF	%D
		FROM	TO			
Average-Aroclor-1016	-----	-----	-----	682691	723811	6.00
Aroclor-1016 (1)	04.02	03.92	04.12	318421	347232	9.00
Aroclor-1016 (2)	04.42	04.32	04.52	575281	639689	11.20
Aroclor-1016 (3)	05.00	04.90	05.10	1434709	1591395	10.90
Aroclor-1016 (4)	05.19	05.09	05.29	548045	536313	2.10
Aroclor-1016 (5)	05.75	05.65	05.85	536998	504425	6.10
Average-Aroclor-1260	-----	-----	-----	1733755	1676752	3.30
Aroclor-1260 (1)	08.72	08.62	08.82	1615493	1445723	10.50
Aroclor-1260 (2)	08.91	08.81	09.01	1209241	1192752	1.40
Aroclor-1260 (3)	09.38	09.28	09.48	938972	918946	2.10
Aroclor-1260 (4)	09.97	09.87	10.07	2624633	2661092	1.40
Aroclor-1260 (5)	10.54	10.44	10.64	2280434	2165250	5.10
Tetrachloro-m-xylene	03.68	03.58	03.78	15482490	16706360	7.90
Decachlorobiphenyl	12.74	12.64	12.84	15639640	14039470	10.20

* - Outside of QC limits

CALIBRATION VERIFICATION SUMMARY

Client: **Bidwell Environmental**
Work Order: **0071061**

Lab Sample ID (X500):	S0H1106-CCV1(2)	Init. Calib. Date(s):	11/20/2019
File ID:	6B42253.D	Date Analyzed:	08/11/2020 07:51
PCBs	Column 2	Matrix:	Soil

Individual Mix Compound		RT WINDOW		$\overline{CF}$	CF	%D
		FROM	TO			
Average-Aroclor-1016 [2C]	-----	-----	-----	247115	241664	2.20
Aroclor-1016 (1) [2C]	05.04	04.94	05.14	105303	107284	1.90
Aroclor-1016 (2) [2C]	05.63	05.53	05.73	232565	206490	11.20
Aroclor-1016 (3) [2C]	06.37	06.27	06.47	531001	524130	1.30
Aroclor-1016 (4) [2C]	06.59	06.49	06.69	208818	213459	2.20
Aroclor-1016 (5) [2C]	07.39	07.29	07.49	157889	156955	0.60
Average-Aroclor-1260 [2C]	-----	-----	-----	656312	600076	8.60
Aroclor-1260 (1) [2C]	10.87	10.77	10.97	628204	565200	10.00
Aroclor-1260 (2) [2C]	11.04	10.94	11.14	423408	387854	8.40
Aroclor-1260 (3) [2C]	11.64	11.54	11.74	399120	339231	15.00
Aroclor-1260 (4) [2C]	12.15	12.05	12.25	954785	880097	7.80
Aroclor-1260 (5) [2C]	13.00	12.90	13.10	876045	827996	5.50
Tetrachloro-m-xylene [2C]	04.43	04.33	04.53	6465871	6408826	0.90
Decachlorobiphenyl [2C]	16.70	16.60	16.80	6553783	5682888	13.30

* - Outside of QC limits

Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200811\6B42253.D\ECD1A.CH Vial: 96
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200811\6B42253.D\ECD2B.CH
Acq On : 11 Aug 2020 7:51 Operator: RL
Sample : SEQ-CCV Inst : HP G1530A
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Aug 11 8:56 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Initial Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um

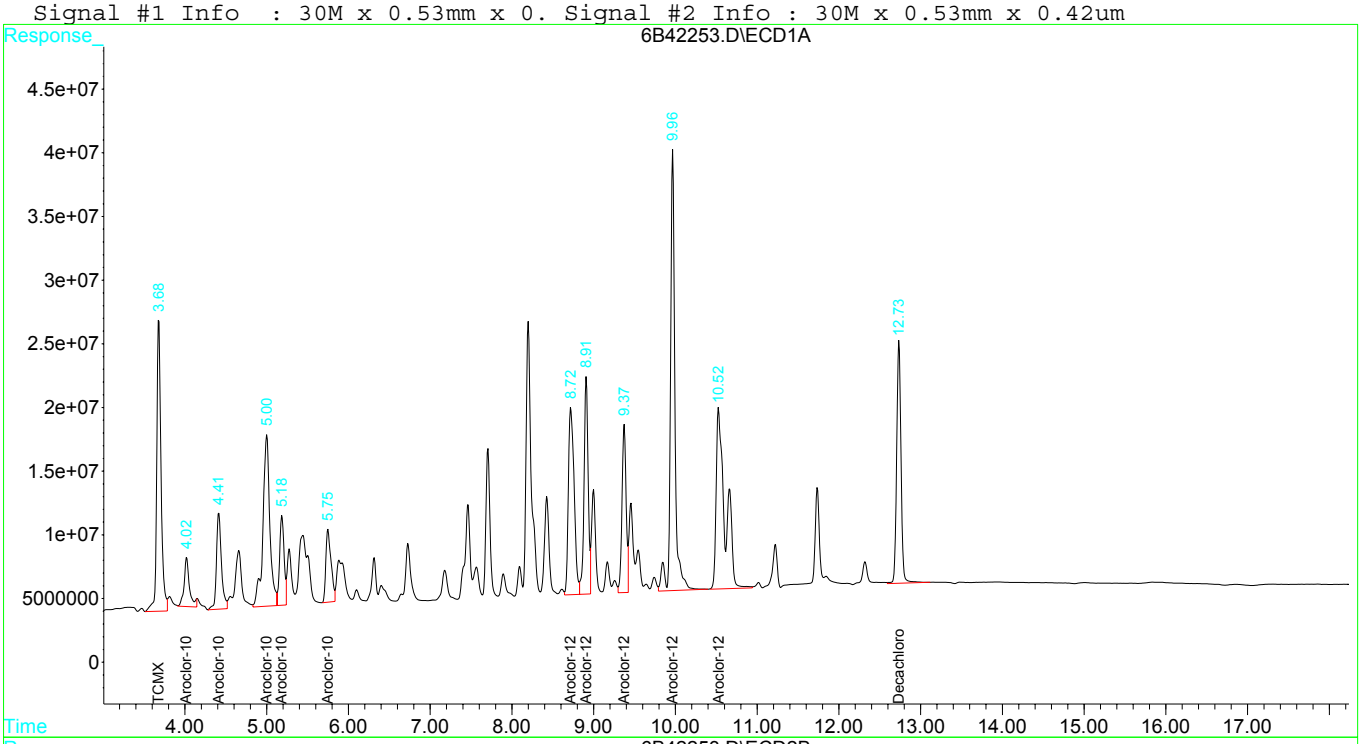
Compound	RT#1	RT#2	Resp#1	Resp#2	ug/kg	ug/kg
System Monitoring Compounds						
1) S TCMX	3.68	4.43	835.3E6	320.4E6	53.952	49.559
Spiked Amount 50.000	Range 40 - 149		Recovery =		107.90%	99.12%
2) S Decachlorobiphen	12.74	16.70f	702.0E6	284.1E6	44.884	43.356
Spiked Amount 50.000	Range 52 - 136		Recovery =		89.77%	86.71%
Target Compounds						
3) L3 Aroclor-1016 (1)	4.02	5.04	173.6E6	53642200	545.240m	509.406
4) L3 Aroclor-1016 (2)	4.42	5.63	319.8E6	103.2E6	555.980	443.942
5) L3 Aroclor-1016 (3)	5.00	6.37	795.7E6	262.1E6	554.605	493.530
6) L3 Aroclor-1016 (4)	5.19	6.59	268.2E6	106.7E6	489.296	511.113
7) L3 Aroclor-1016 (5)	5.75	7.39	252.2E6	78477535	469.671	497.044
Sum Aroclor-1016 (1)			1809.5E6	604.2E6	2614.793	2455.035
Average Aroclor-1016 (1)					522.959	491.007
Sum Aroclor-1221 (1)			0	0	N.D.	N.D.
Average Aroclor-1221 (1)					0.000	0.000
Sum Aroclor-1232 (1)			0	0	N.D.	N.D.
Average Aroclor-1232 (1)					0.000	0.000
Sum Aroclor-1242 (1)			0	0	N.D.	N.D.
Average Aroclor-1242 (1)					0.000	0.000
Sum Aroclor-1248 (1)			0	0	N.D.	N.D.
Average Aroclor-1248 (1)					0.000	0.000
Sum Aroclor-1254 (1)			0	0	N.D.	N.D.
Average Aroclor-1254 (1)					0.000	0.000
37) L9 Aroclor-1260 (1)	8.72	10.87f	722.9E6	282.6E6	447.456	449.854
38) L9 Aroclor-1260 (2)	8.91f	11.04f	596.4E6	193.9E6	493.182	458.015
39) L9 Aroclor-1260 (3)	9.38f	11.64f	459.5E6	169.6E6	489.336	424.973
40) L9 Aroclor-1260 (4)	9.97	12.15f	1330.5E6	440.0E6	506.946	460.888
41) L9 Aroclor-1260 (5)	10.54	13.00f	1082.6E6	414.0E6	474.745	472.576
Sum Aroclor-1260 (1)			4191.9E6	1500.2E6	2411.665	2266.307
Average Aroclor-1260 (1)					482.333	453.261
Sum Aroclor-1262 (1)			0	0	N.D.	N.D.
Average Aroclor-1262 (1)					0.000	0.000
Sum Aroclor-1268 (1)			0	0	N.D.	N.D.
Average Aroclor-1268 (1)					0.000	0.000

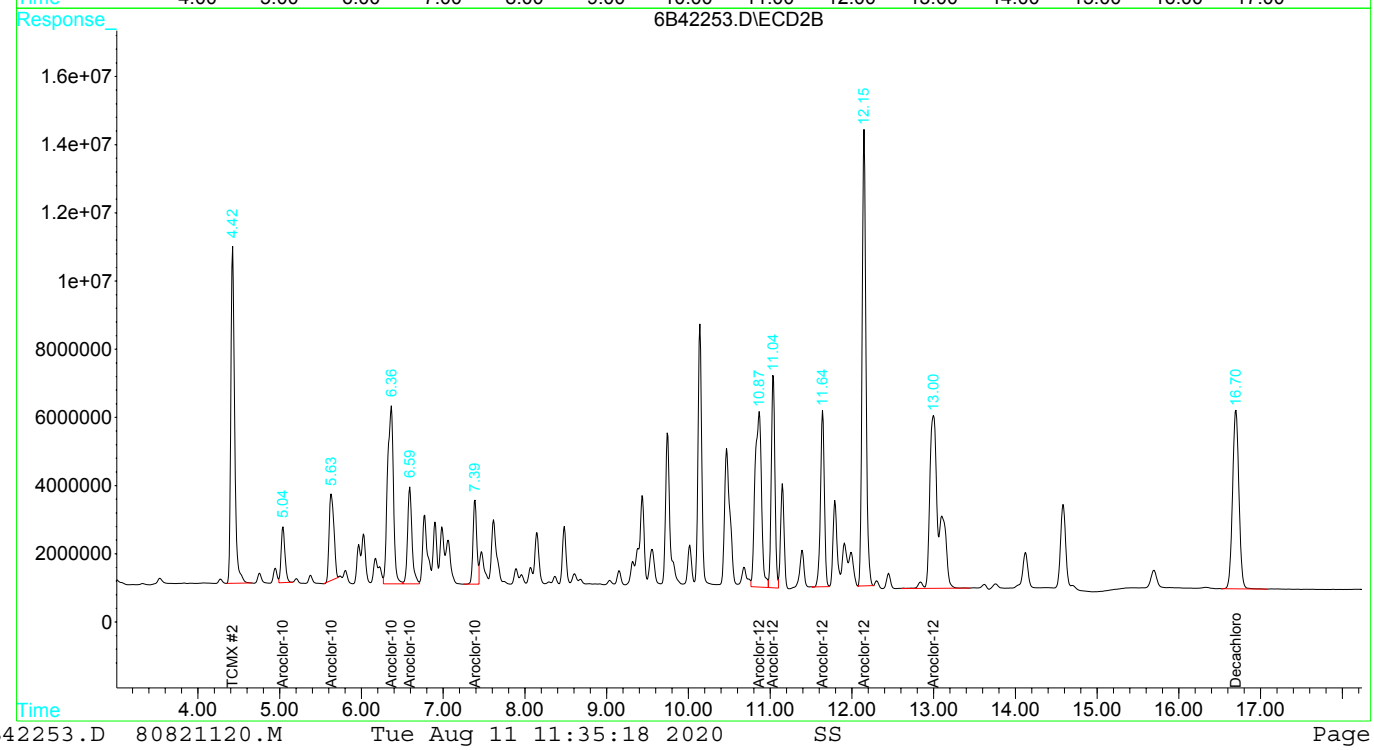
Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200811\6B42253.D\ECD1A.CH Vial: 96
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200811\6B42253.D\ECD2B.CH
Acq On : 11 Aug 2020 7:51 Operator: RL
Sample : SEQ-CCV Inst : HP G1530A
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Aug 11 8:56 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Multiple Level Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um





CALIBRATION VERIFICATION SUMMARY

Client: **Bidwell Environmental**
Work Order: **0071061**

Lab Sample ID (X500):	S0H1106-CCV2(1)	Init. Calib. Date(s):	11/20/2019
File ID:	6B42271.D	Date Analyzed:	08/11/2020 14:57
PCBs	Column 1	Matrix:	Soil

Individual Mix Compound		RT WINDOW		$\overline{CF}$	CF	%D
		FROM	TO			
Average-Aroclor-1016	-----	-----	-----	682691	659486	3.40
Aroclor-1016 (1)	04.02	03.92	04.12	318421	349308	9.70
Aroclor-1016 (2)	04.41	04.31	04.51	575281	587042	2.00
Aroclor-1016 (3)	05.00	04.90	05.10	1434709	1445232	0.70
Aroclor-1016 (4)	05.19	05.09	05.29	548045	463643	15.40
Aroclor-1016 (5)	05.75	05.65	05.85	536998	452203	15.80
Average-Aroclor-1260	-----	-----	-----	1733755	1609266	7.20
Aroclor-1260 (1)	08.72	08.62	08.82	1615493	1561959	3.30
Aroclor-1260 (2)	08.91	08.81	09.01	1209241	1155613	4.40
Aroclor-1260 (3)	09.38	09.28	09.48	938972	904879	3.60
Aroclor-1260 (4)	09.97	09.87	10.07	2624633	2259176	13.90
Aroclor-1260 (5)	10.54	10.44	10.64	2280434	2164704	5.10
Tetrachloro-m-xylene	03.68	03.58	03.78	15482490	15545220	0.40
Decachlorobiphenyl	12.74	12.64	12.84	15639640	13266940	15.20

* - Outside of QC limits

CALIBRATION VERIFICATION SUMMARY

Client: **Bidwell Environmental**
Work Order: **0071061**

Lab Sample ID (X500):	S0H1106-CCV2(2)	Init. Calib. Date(s):	11/20/2019
File ID:	6B42271.D	Date Analyzed:	08/11/2020 14:57
PCBs	Column 2	Matrix:	Soil

Individual Mix Compound		RT WINDOW		$\overline{CF}$	CF	%D
		FROM	TO			
Average-Aroclor-1016 [2C]	-----	-----	-----	247115	212540	14.00
Aroclor-1016 (1) [2C]	05.04	04.94	05.14	105303	92335	12.30
Aroclor-1016 (2) [2C]	05.63	05.53	05.73	232565	199986	14.00
Aroclor-1016 (3) [2C]	06.37	06.27	06.47	531001	460170	13.30
Aroclor-1016 (4) [2C]	06.59	06.49	06.69	208818	174855	16.30
Aroclor-1016 (5) [2C]	07.39	07.29	07.49	157889	135353	14.30
Average-Aroclor-1260 [2C]	-----	-----	-----	656312	598537	8.80
Aroclor-1260 (1) [2C]	10.87	10.77	10.97	628204	563230	10.30
Aroclor-1260 (2) [2C]	11.04	10.94	11.14	423408	365036	13.80
Aroclor-1260 (3) [2C]	11.64	11.54	11.74	399120	352311	11.70
Aroclor-1260 (4) [2C]	12.15	12.05	12.25	954785	894224	6.30
Aroclor-1260 (5) [2C]	13.00	12.90	13.10	876045	817883	6.60
Tetrachloro-m-xylene [2C]	04.43	04.33	04.53	6465871	5809718	10.10
Decachlorobiphenyl [2C]	16.70	16.60	16.80	6553783	5858030	10.60

* - Outside of QC limits

Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200811\6B42271.D\ECD1A.CH Vial: 96
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200811\6B42271.D\ECD2B.CH
Acq On : 11 Aug 2020 14:57 Operator: RL
Sample : SEQ-CCV Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Aug 12 6:41 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Initial Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um

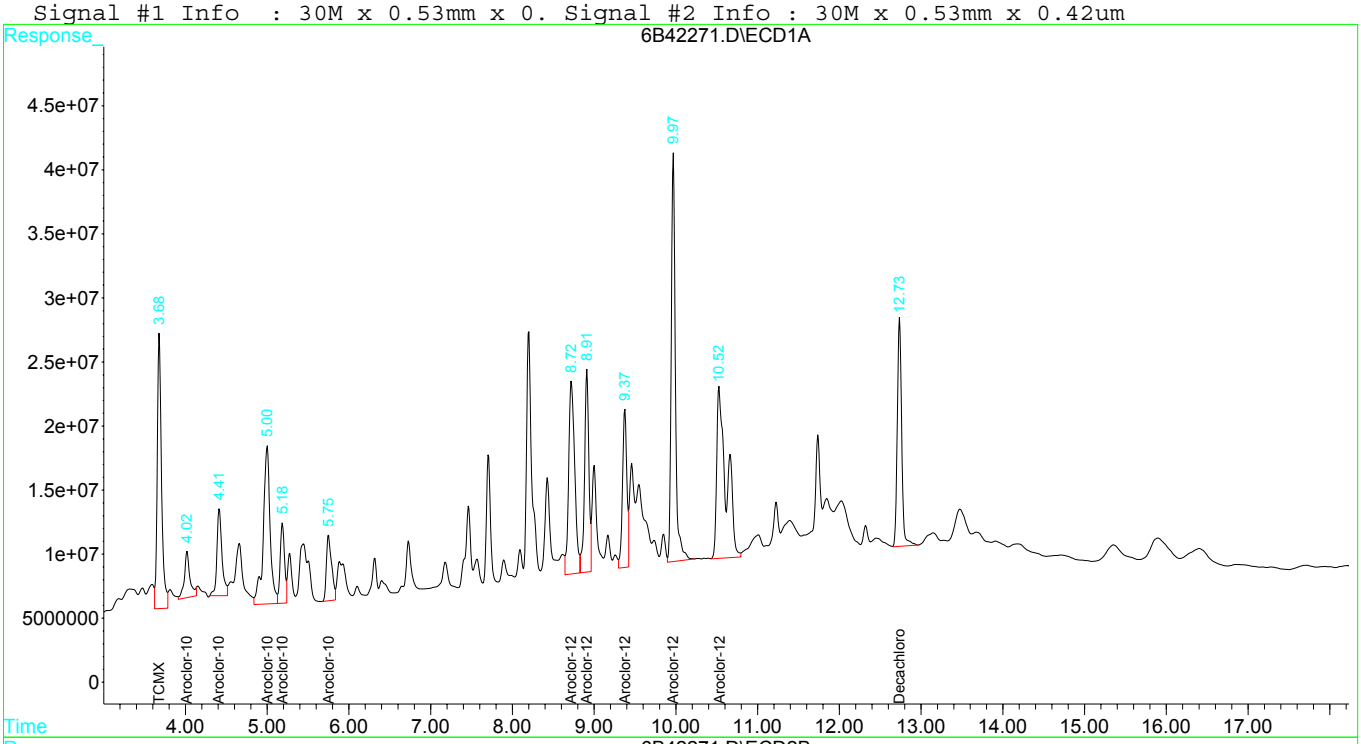
Compound	RT#1	RT#2	Resp#1	Resp#2	ug/kg	ug/kg
System Monitoring Compounds						
1) S TCMX	3.68	4.43	777.3E6	290.5E6	50.203	44.926
Spiked Amount 50.000	Range 40 - 149		Recovery =		100.41%	89.85%
2) S Decachlorobiphen	12.74	16.70f	663.3E6	292.9E6	42.414	44.692
Spiked Amount 50.000	Range 52 - 136		Recovery =		84.83%	89.38%
Target Compounds						
3) L3 Aroclor-1016 (1)	4.02	5.04	174.7E6	46167426	548.499m	438.423
4) L3 Aroclor-1016 (2)	4.41	5.63	293.5E6	99992830	510.222m	429.957
5) L3 Aroclor-1016 (3)	5.00	6.37	722.6E6	230.1E6	503.667	433.304
6) L3 Aroclor-1016 (4)	5.19	6.59	231.8E6	87427452	422.997	418.678
7) L3 Aroclor-1016 (5)	5.75	7.39	226.1E6	67676456	421.048	428.634
Sum Aroclor-1016 (1)			1648.7E6	531.3E6	2406.433	2148.997
Average Aroclor-1016 (1)					481.287	429.799
Sum Aroclor-1221 (1)			0	0	N.D.	N.D.
Average Aroclor-1221 (1)					0.000	0.000
Sum Aroclor-1232 (1)			0	0	N.D.	N.D.
Average Aroclor-1232 (1)					0.000	0.000
Sum Aroclor-1242 (1)			0	0	N.D.	N.D.
Average Aroclor-1242 (1)					0.000	0.000
Sum Aroclor-1248 (1)			0	0	N.D.	N.D.
Average Aroclor-1248 (1)					0.000	0.000
Sum Aroclor-1254 (1)			0	0	N.D.	N.D.
Average Aroclor-1254 (1)					0.000	0.000
37) L9 Aroclor-1260 (1)	8.72	10.87f	781.0E6	281.6E6	483.431	448.286m
38) L9 Aroclor-1260 (2)	8.91	11.04f	577.8E6	182.5E6	477.826	431.069m
39) L9 Aroclor-1260 (3)	9.38	11.64f	452.4E6	176.2E6	481.846	441.360m
40) L9 Aroclor-1260 (4)	9.97	12.15f	1129.6E6	447.1E6	430.379	468.286m
41) L9 Aroclor-1260 (5)	10.54	13.00f	1082.4E6	408.9E6	474.626	466.804m
Sum Aroclor-1260 (1)			4023.2E6	1496.3E6	2348.108	2255.805
Average Aroclor-1260 (1)					469.622	451.161
Sum Aroclor-1262 (1)			0	0	N.D.	N.D.
Average Aroclor-1262 (1)					0.000	0.000
Sum Aroclor-1268 (1)			0	0	N.D.	N.D.
Average Aroclor-1268 (1)					0.000	0.000

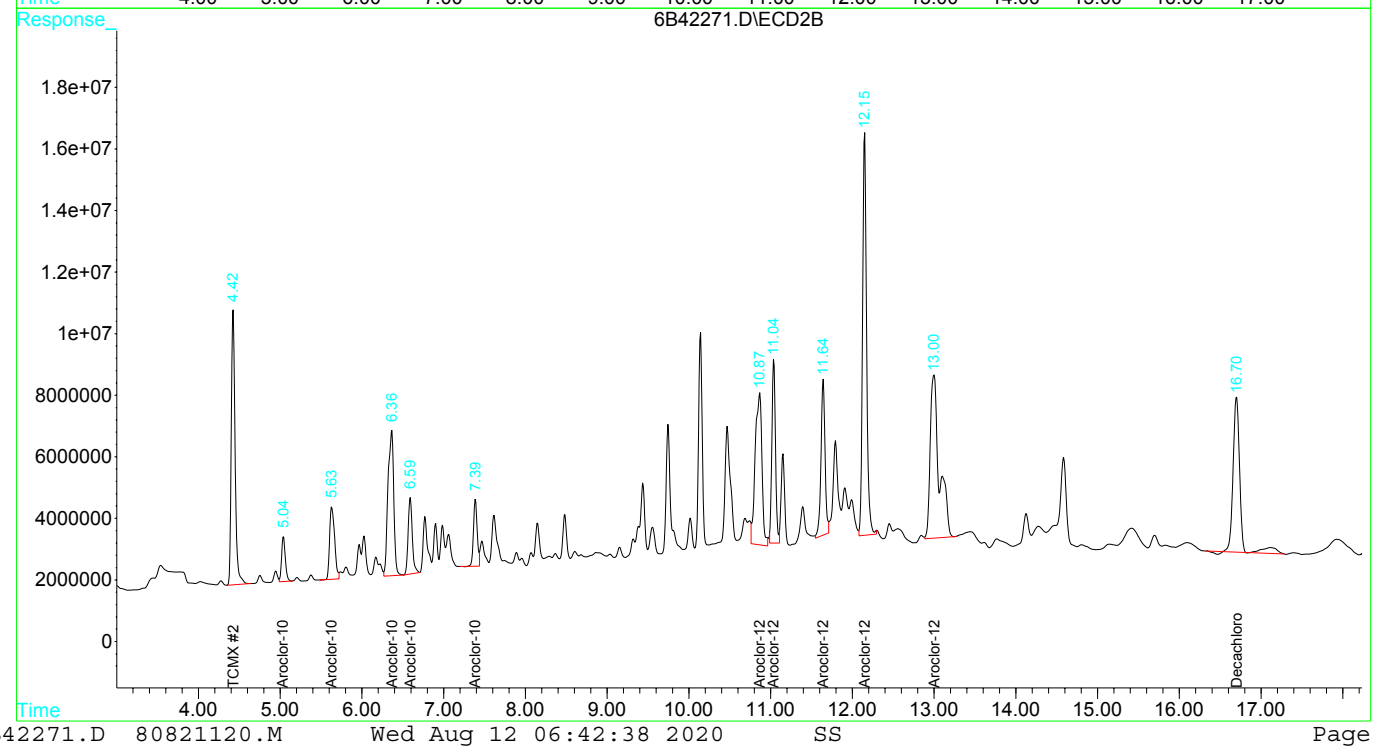
Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200811\6B42271.D\ECD1A.CH Vial: 96
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200811\6B42271.D\ECD2B.CH
Acq On : 11 Aug 2020 14:57 Operator: RL
Sample : SEQ-CCV Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Aug 12 6:41 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Multiple Level Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um





CALIBRATION VERIFICATION SUMMARY

Client: **Bidwell Environmental**
Work Order: **0071061**

Lab Sample ID (X500):	S0H1704-CCV1(1)	Init. Calib. Date(s):	11/20/2019
File ID:	6B42406.D	Date Analyzed:	08/17/2020 07:08
PCBs	Column 1	Matrix:	Soil

Individual Mix Compound		RT WINDOW		$\overline{CF}$	CF	%D
		FROM	TO			
Average-Aroclor-1016	-----	-----	-----	682691	730520	7.00
Aroclor-1016 (1)	04.01	03.91	04.11	318421	283035	11.10
Aroclor-1016 (2)	04.41	04.31	04.51	575281	655129	13.90
Aroclor-1016 (3)	05.00	04.90	05.10	1434709	1646688	14.80
Aroclor-1016 (4)	05.18	05.08	05.28	548045	539507	1.60
Aroclor-1016 (5)	05.75	05.65	05.85	536998	528243	1.60
Average-Aroclor-1260	-----	-----	-----	1733755	1585454	8.60
Aroclor-1260 (1)	08.72	08.62	08.82	1615493	1409069	12.80
Aroclor-1260 (2)	08.91	08.81	09.01	1209241	1138689	5.80
Aroclor-1260 (3)	09.37	09.27	09.47	938972	878170	6.50
Aroclor-1260 (4)	09.97	09.87	10.07	2624633	2487910	5.20
Aroclor-1260 (5)	10.53	10.43	10.63	2280434	2013432	11.70
Tetrachloro-m-xylene	03.68	03.58	03.78	15482490	17166980	10.90
Decachlorobiphenyl	12.73	12.63	12.83	15639640	13401900	14.30

* - Outside of QC limits

CALIBRATION VERIFICATION SUMMARY

Client: **Bidwell Environmental**
Work Order: **0071061**

Lab Sample ID (X500):	S0H1704-CCV1(2)	Init. Calib. Date(s):	11/20/2019
File ID:	6B42406.D	Date Analyzed:	08/17/2020 07:08
PCBs	Column 2	Matrix:	Soil

Individual Mix Compound		RT WINDOW		$\overline{CF}$	CF	%D
		FROM	TO			
Average-Aroclor-1016 [2C]	-----	-----	-----	247115	251952	2.00
Aroclor-1016 (1) [2C]	05.04	04.94	05.14	105303	110961	5.40
Aroclor-1016 (2) [2C]	05.63	05.53	05.73	232565	233953	0.60
Aroclor-1016 (3) [2C]	06.36	06.26	06.46	531001	540389	1.80
Aroclor-1016 (4) [2C]	06.59	06.49	06.69	208818	215246	3.10
Aroclor-1016 (5) [2C]	07.39	07.29	07.49	157889	159212	0.80
Average-Aroclor-1260 [2C]	-----	-----	-----	656312	612812	6.60
Aroclor-1260 (1) [2C]	10.86	10.76	10.96	628204	573924	8.60
Aroclor-1260 (2) [2C]	11.04	10.94	11.14	423408	397736	6.10
Aroclor-1260 (3) [2C]	11.64	11.54	11.74	399120	378569	5.10
Aroclor-1260 (4) [2C]	12.15	12.05	12.25	954785	911350	4.50
Aroclor-1260 (5) [2C]	12.99	12.89	13.09	876045	802477	8.40
Tetrachloro-m-xylene [2C]	04.42	04.32	04.52	6465871	6667768	3.10
Decachlorobiphenyl [2C]	16.69	16.59	16.79	6553783	5379390	17.90

* - Outside of QC limits

Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200817\6B42406.D\ECD1A.CH Vial: 96
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200817\6B42406.D\ECD2B.CH
Acq On : 17 Aug 2020 7:08 Operator: RL
Sample : SEQ-CCV Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Aug 17 10:18 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Initial Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um

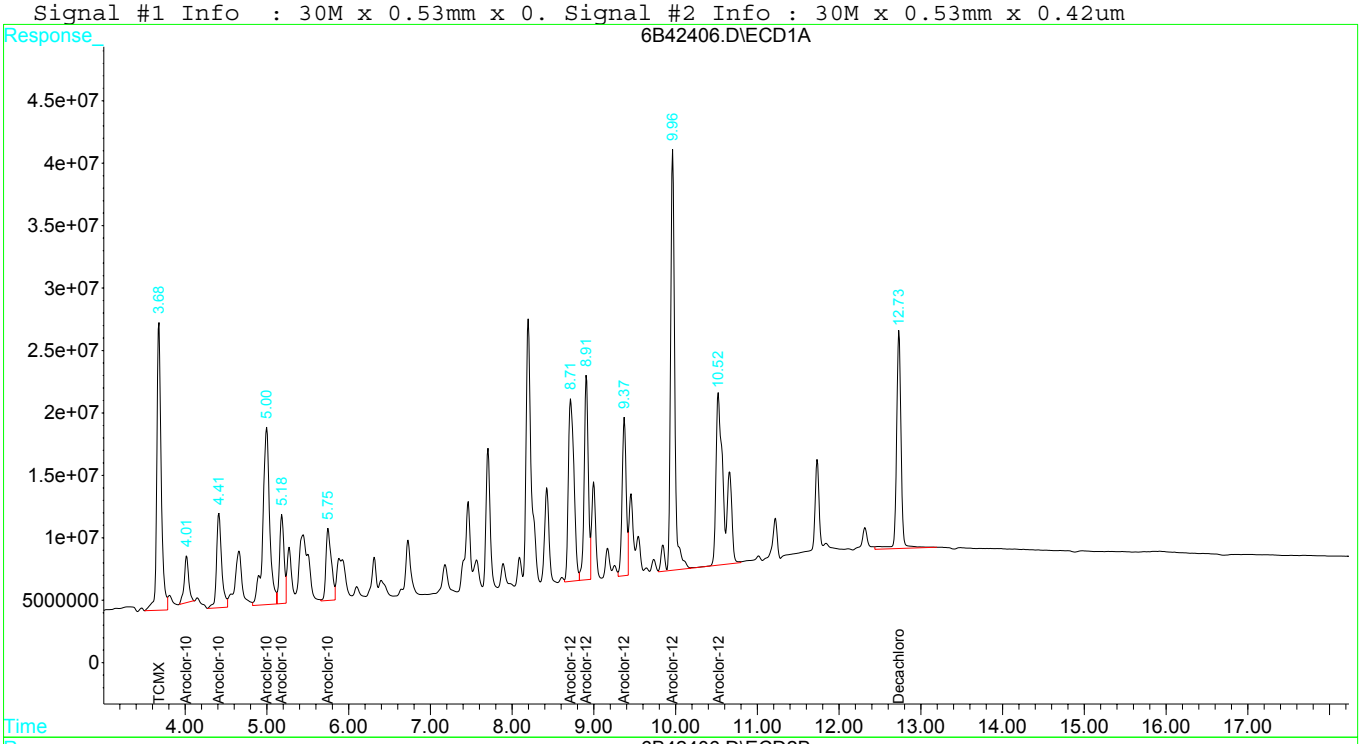
Compound	RT#1	RT#2	Resp#1	Resp#2	ug/kg	ug/kg
System Monitoring Compounds						
1) S TCMX	3.68	4.42	858.3E6	333.4E6	55.440	51.561
Spiked Amount 50.000	Range 40 - 149		Recovery =		110.88%	103.12%
2) S Decachlorobiphen	12.73f	16.69f	670.1E6	269.0E6	42.846	41.040m
Spiked Amount 50.000	Range 52 - 136		Recovery =		85.69%	82.08%
Target Compounds						
3) L3 Aroclor-1016 (1)	4.01	5.04	141.5E6	55480427	444.435m	526.863
4) L3 Aroclor-1016 (2)	4.41	5.63	327.6E6	117.0E6	569.399	502.984
5) L3 Aroclor-1016 (3)	5.00	6.36	823.3E6	270.2E6	573.875	508.840
6) L3 Aroclor-1016 (4)	5.18	6.59	269.8E6	107.6E6	492.210	515.391
7) L3 Aroclor-1016 (5)	5.75	7.39	264.1E6	79605832	491.849	504.190
Sum Aroclor-1016 (1)			1826.3E6	629.9E6	2571.768	2558.269
Average Aroclor-1016 (1)					514.354	511.654
Sum Aroclor-1221 (1)			0	0	N.D.	N.D.
Average Aroclor-1221 (1)					0.000	0.000
Sum Aroclor-1232 (1)			0	0	N.D.	N.D.
Average Aroclor-1232 (1)					0.000	0.000
Sum Aroclor-1242 (1)			0	0	N.D.	N.D.
Average Aroclor-1242 (1)					0.000	0.000
Sum Aroclor-1248 (1)			0	0	N.D.	N.D.
Average Aroclor-1248 (1)					0.000	0.000
Sum Aroclor-1254 (1)			0	0	N.D.	N.D.
Average Aroclor-1254 (1)					0.000	0.000
37) L9 Aroclor-1260 (1)	8.72	10.86f	704.5E6	287.0E6	436.111	456.798
38) L9 Aroclor-1260 (2)	8.91f	11.04f	569.3E6	198.9E6	470.828	469.685
39) L9 Aroclor-1260 (3)	9.37f	11.64f	439.1E6	189.3E6	467.623	474.254
40) L9 Aroclor-1260 (4)	9.97f	12.15f	1244.0E6	455.7E6	473.954	477.254
41) L9 Aroclor-1260 (5)	10.53	12.99f	1006.7E6	401.2E6	441.458	458.011m
Sum Aroclor-1260 (1)			3963.6E6	1532.0E6	2289.974	2336.003
Average Aroclor-1260 (1)					457.995	467.201
Sum Aroclor-1262 (1)			0	0	N.D.	N.D.
Average Aroclor-1262 (1)					0.000	0.000
Sum Aroclor-1268 (1)			0	0	N.D.	N.D.
Average Aroclor-1268 (1)					0.000	0.000

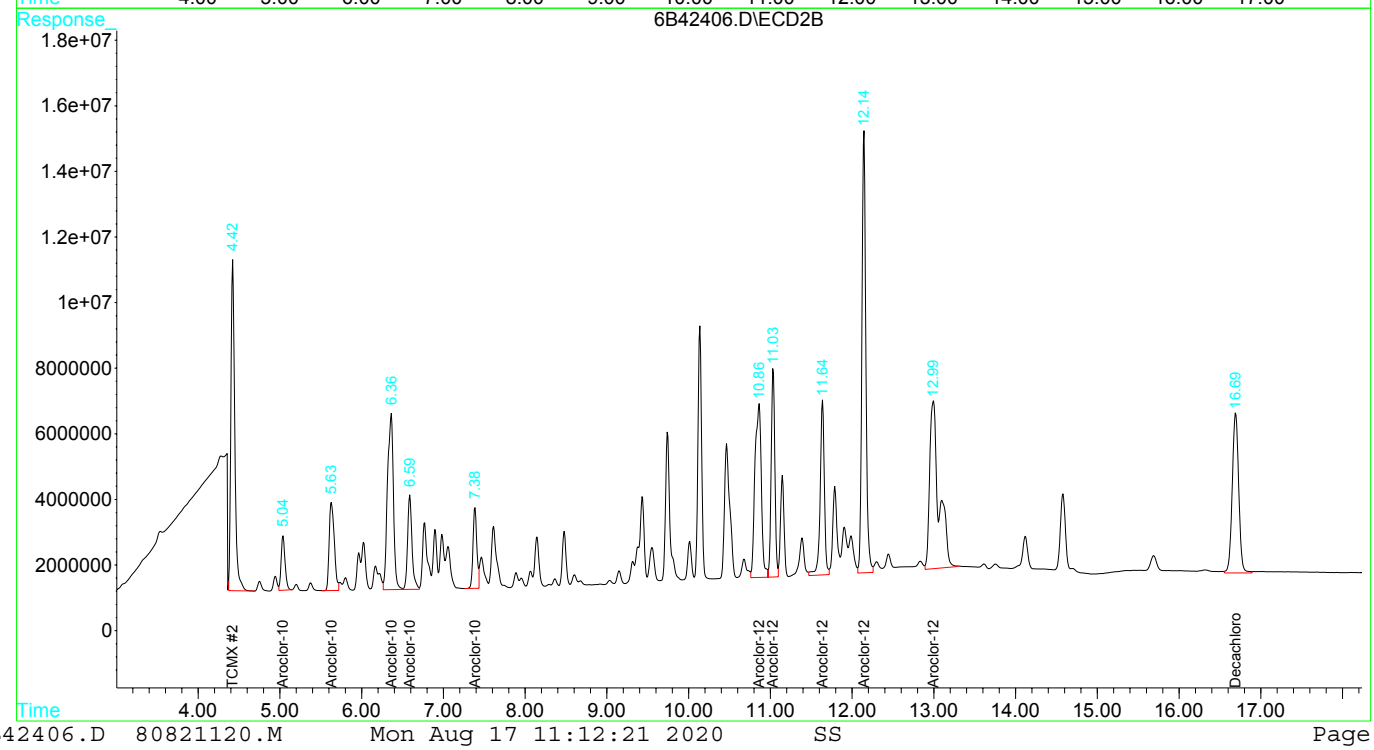
Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200817\6B42406.D\ECD1A.CH Vial: 96
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200817\6B42406.D\ECD2B.CH
Acq On : 17 Aug 2020 7:08 Operator: RL
Sample : SEQ-CCV Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Aug 17 10:18 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Multiple Level Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um





CALIBRATION VERIFICATION SUMMARY

Client: **Bidwell Environmental**
Work Order: **0071061**

Lab Sample ID (X500):	S0H1704-CCV2(1)	Init. Calib. Date(s):	11/20/2019
File ID:	6B42427.D	Date Analyzed:	08/17/2020 17:23
PCBs	Column 1	Matrix:	Soil

Individual Mix Compound		RT WINDOW		$\overline{CF}$	CF	%D
		FROM	TO			
Average-Aroclor-1016	-----	-----	-----	682691	749809	9.80
Aroclor-1016 (1)	04.01	03.91	04.11	318421	369484	16.00
Aroclor-1016 (2)	04.40	04.30	04.50	575281	665010	15.60
Aroclor-1016 (3)	04.99	04.89	05.09	1434709	1614001	12.50
Aroclor-1016 (4)	05.17	05.07	05.27	548045	531273	3.10
Aroclor-1016 (5)	05.74	05.64	05.84	536998	569276	6.00
Average-Aroclor-1260	-----	-----	-----	1733755	1566116	9.70
Aroclor-1260 (1)	08.71	08.61	08.81	1615493	1474065	8.80
Aroclor-1260 (2)	08.89	08.79	08.99	1209241	1169114	3.30
Aroclor-1260 (3)	09.36	09.26	09.46	938972	791069	15.80
Aroclor-1260 (4)	09.95	09.85	10.05	2624633	2342958	10.70
Aroclor-1260 (5)	10.53	10.43	10.63	2280434	2053372	10.00
Tetrachloro-m-xylene	03.67	03.57	03.77	15482490	17119470	10.60
Decachlorobiphenyl	12.72	12.62	12.82	15639640	13264620	15.20

* - Outside of QC limits

CALIBRATION VERIFICATION SUMMARY

Client: **Bidwell Environmental**
Work Order: **0071061**

Lab Sample ID (X500):	S0H1704-CCV2(2)	Init. Calib. Date(s):	11/20/2019
File ID:	6B42427.D	Date Analyzed:	08/17/2020 17:23
PCBs	Column 2	Matrix:	Soil

Individual Mix Compound		RT WINDOW		$\overline{CF}$	CF	%D
		FROM	TO			
Average-Aroclor-1016 [2C]	-----	-----	-----	247115	251229	1.70
Aroclor-1016 (1) [2C]	05.04	04.94	05.14	105303	104956	0.30
Aroclor-1016 (2) [2C]	05.64	05.54	05.74	232565	245908	5.70
Aroclor-1016 (3) [2C]	06.37	06.27	06.47	531001	501744	5.50
Aroclor-1016 (4) [2C]	06.60	06.50	06.70	208818	207379	0.70
Aroclor-1016 (5) [2C]	07.39	07.29	07.49	157889	196159	24.20
Average-Aroclor-1260 [2C]	-----	-----	-----	656312	629243	4.10
Aroclor-1260 (1) [2C]	10.87	10.77	10.97	628204	588829	6.30
Aroclor-1260 (2) [2C]	11.04	10.94	11.14	423408	404317	4.50
Aroclor-1260 (3) [2C]	11.64	11.54	11.74	399120	380002	4.80
Aroclor-1260 (4) [2C]	12.15	12.05	12.25	954785	1018739	6.70
Aroclor-1260 (5) [2C]	13.00	12.90	13.10	876045	754327	13.90
Tetrachloro-m-xylene [2C]	04.43	04.33	04.53	6465871	6497676	0.50
Decachlorobiphenyl [2C]	16.69	16.59	16.79	6553783	5656572	13.70

* - Outside of QC limits

Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200817\6B42427.D\ECD1A.CH Vial: 96
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200817\6B42427.D\ECD2B.CH
Acq On : 17 Aug 2020 17:23 Operator: RL
Sample : SEQ-CCV Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Aug 18 10:16 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Initial Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um

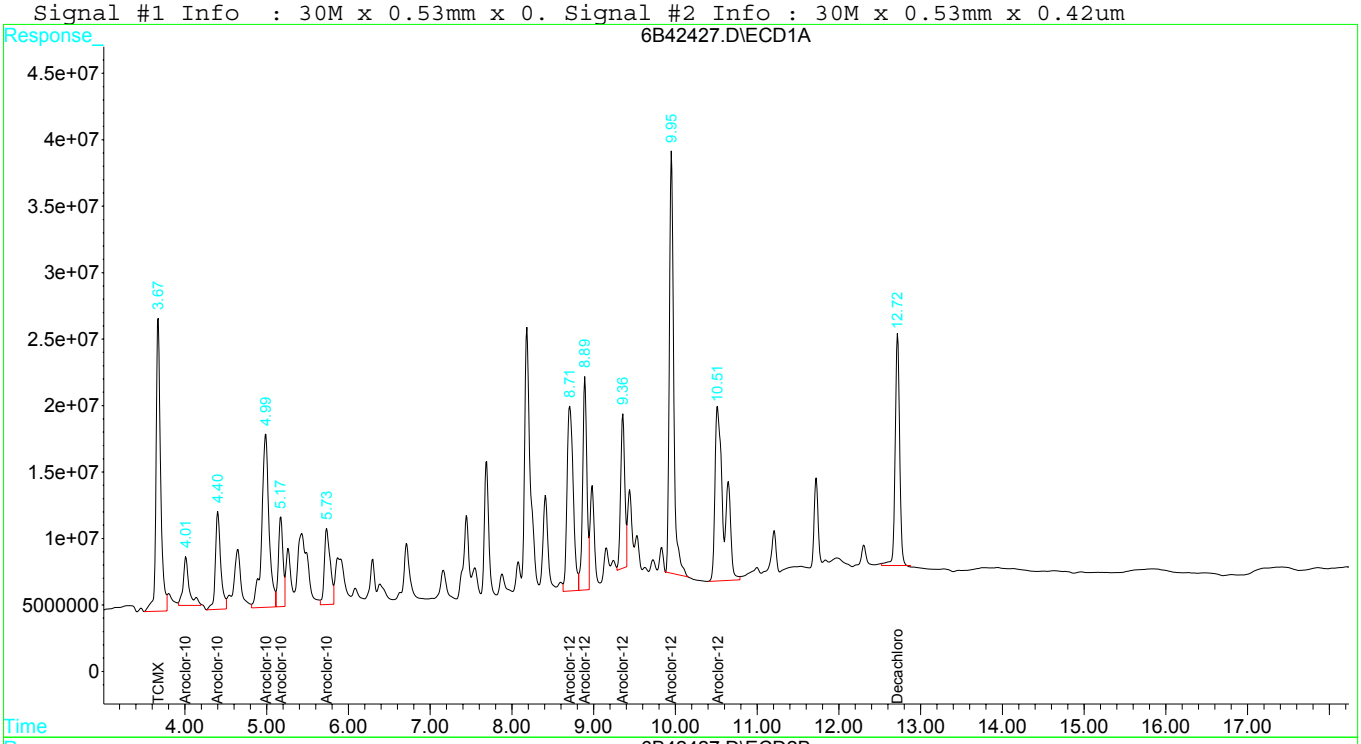
Compound	RT#1	RT#2	Resp#1	Resp#2	ug/kg	ug/kg
System Monitoring Compounds						
1) S TCMX	3.67	4.43	856.0E6	324.9E6	55.287	50.246
Spiked Amount 50.000	Range 40 - 149		Recovery =		110.57%	100.49%
2) S Decachlorobiphen	12.72f	16.69f	663.2E6	282.8E6	42.407m	43.155m
Spiked Amount 50.000	Range 52 - 136		Recovery =		84.81%	86.31%
Target Compounds						
3) L3 Aroclor-1016 (1)	4.01f	5.04	184.7E6	52477979	580.181m	498.351
4) L3 Aroclor-1016 (2)	4.40f	5.64	332.5E6	123.0E6	577.988	528.687
5) L3 Aroclor-1016 (3)	4.99	6.37	807.0E6	250.9E6	562.484	472.451
6) L3 Aroclor-1016 (4)	5.17f	6.60	265.6E6	103.7E6	484.698	496.555
7) L3 Aroclor-1016 (5)	5.74f	7.39	284.6E6	98079389	530.055	621.194
Sum Aroclor-1016 (1)			1874.5E6	628.1E6	2735.405	2617.238
Average Aroclor-1016 (1)					547.081	523.448
Sum Aroclor-1221 (1)			0	0	N.D.	N.D.
Average Aroclor-1221 (1)					0.000	0.000
Sum Aroclor-1232 (1)			0	0	N.D.	N.D.
Average Aroclor-1232 (1)					0.000	0.000
Sum Aroclor-1242 (1)			0	0	N.D.	N.D.
Average Aroclor-1242 (1)					0.000	0.000
Sum Aroclor-1248 (1)			0	0	N.D.	N.D.
Average Aroclor-1248 (1)					0.000	0.000
Sum Aroclor-1254 (1)			0	0	N.D.	N.D.
Average Aroclor-1254 (1)					0.000	0.000
37) L9 Aroclor-1260 (1)	8.71f	10.87f	737.0E6	294.4E6	456.228	468.661
38) L9 Aroclor-1260 (2)	8.89f	11.04f	584.6E6	202.2E6	483.408	477.456
39) L9 Aroclor-1260 (3)	9.36f	11.64f	395.5E6	190.0E6	421.242m	476.049
40) L9 Aroclor-1260 (4)	9.95f	12.15f	1171.5E6	509.4E6	446.340m	533.492
41) L9 Aroclor-1260 (5)	10.53f	13.00f	1026.7E6	377.2E6	450.215	430.529m
Sum Aroclor-1260 (1)			3915.3E6	1573.1E6	2257.433	2386.187
Average Aroclor-1260 (1)					451.487	477.237
Sum Aroclor-1262 (1)			0	0	N.D.	N.D.
Average Aroclor-1262 (1)					0.000	0.000
Sum Aroclor-1268 (1)			0	0	N.D.	N.D.
Average Aroclor-1268 (1)					0.000	0.000

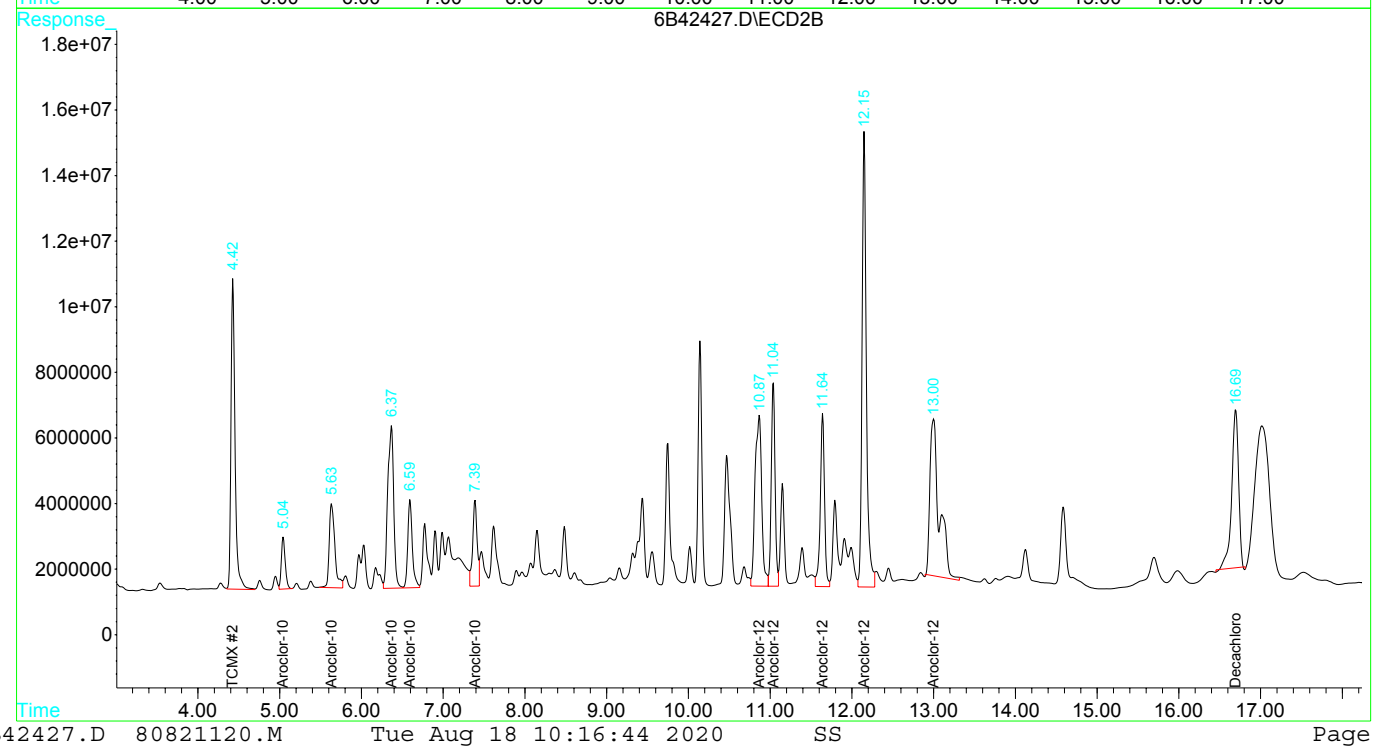
Quantitation Report (QT Reviewed)

Signal #1 : G:\HPCHEM\GCECD6\DATA\20200817\6B42427.D\ECD1A.CH Vial: 96
Signal #2 : G:\HPCHEM\GCECD6\DATA\20200817\6B42427.D\ECD2B.CH
Acq On : 17 Aug 2020 17:23 Operator: RL
Sample : SEQ-CCV Inst : GCECD-6
Misc : Multiplr: 1.00
IntFile Signal #1: autoint1.e IntFile Signal #2: autoint2.e
Quant Time: Aug 18 10:16 2020 Quant Results File: 80821120.RES

Quant Method : G:\HPCHEM\G...\80821120.M (Chemstation Integrator)
Title : PCBs by EPA Method SW-846 8082A and EPA 608.3
Last Update : Thu Jul 16 07:38:47 2020
Response via : Multiple Level Calibration
DataAcq Meth : RUNPCB1.M

Volume Inj. : 1ul
Signal #1 Phase : RTx-50 Signal #2 Phase: RTx-CLPesticides II
Signal #1 Info : 30M x 0.53mm x 0. Signal #2 Info : 30M x 0.53mm x 0.42um





AQUA PRO-TECH LABORATORIES
Certified Environmental Testing

GENERAL CHEMISTRY

Bidwell Environmental

Work Order: 0071061

Project: Westchester PS

ANALYSIS DATA SHEET

General Chemistry

Client: **Bidwell Environmental**
Project: **Westchester PS**
Work Order: **0071061**

General Chemistry

0071061-01 (Paint Chips) - FR-PCB-01

Analyte	Units	Conc.	RL	DF	Qual	Analyzed	Method
Percent Solids	%	100		1		07/23/20 13:59	Gravimetric

0071061-02 (Paint Chips) - FR-PCB-02

Analyte	Units	Conc.	RL	DF	Qual	Analyzed	Method
Percent Solids	%	100		1		07/23/20 13:59	Gravimetric

ND - Indicates compound analyzed for but not detected
J - Indicates estimated value
B - Indicates compound found in associated blank
E - Concentration exceeds highest calibration standard

D - Indicates result is based on a dilution
H - Indicates a Hold Time violation
P - Greater than 25% diff. between 2 GC columns.
MDL - Minimum detection limit, **RL** - Reporting limit

NICHE ANALYSIS, INC.

399 Knollwood Road, Suite 208 · White Plains, NY 10603

Tel: (914) 288-0805 · Fax: (914) 288-0807

BULK SAMPLE ANALYSIS REPORT

BIDWELL ENVIRONMENTAL, LLC
1353 KINGS HIGHWAY
P.O. BOX 266
SUGAR LOAF, NY 10981

Niche Project #: 20-25270-1

PROJECT:	Westchester Pump Stations	**ANALYST:**	Bing Liang
BIDWELL PROJECT #:	NA	**DATE SAMPLED:**	07-08-20
LOCATION:	Various Pump Stations	**DATE RECEIVED:**	07-13-20
ADDRESS:	Various	**DATE ANALYZED:**	07-15-20

Sample No./ Lab ID	Type of Material	Color	Area	Asbestos Content & Percent	Non-Asbestos Fiber Content & Percent	Non Fibrous
WV-ASB- 07 *B07004101*	Grey Concrete Conduit Penetration	Grey Brown	Weaver St./ PS, Dry Well	**ND**	ND	5% Paint 80% Gypsum 15% Mineral Filler
WV-ASB- 08 *B07004102*	Grey Concrete Conduit Penetration	Grey Brown	Weaver St./ PS, Dry Well	**ND**	ND	5% Paint 80% Gypsum 15% Mineral Filler
FR-ASB-29 *B07004103*	Grey Fibrous Gasket In Blue Pump	Blue Brown	Fenimore Rd., Dry Well	**80% Chrysotile**	ND	20% Other
FR-ASB-30 *B07004104*	Grey Fibrous Gasket In Blue Pump	NA/PS	Fenimore Rd., Dry Well	**Not Analysis/Positive Stop**		

Note 1: The balance of each sample is non-fibrous particulates. Please contact us promptly if you have any question about these results. Analysis was performed by using "Point Count Technique" as required and recommended by the New York State Department of Health and USEPA Interim Method for "Identification of Asbestos Fibers in Bulk Samples". This report must not be used by the client to claim product endorsements by NVLAP or any agency of the US government. This report relates only to the items listed. The above samples were collected and submitted to NICHE by the client. All sample information was provided by the client. *Polarized light microscopy 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 the material can be considered or treated as non-asbestos-containing.
Note 2: NA/PS = Not Analyzed/Stop on Positive, ND = None Detected

SAMPLE ANALYSIS BY:	POLARIZED LIGHT MICROSCOPY – DISPERSION STANDING (PLM-DS)
METHOD OF SAMPLE PREPARATION & ANALYSIS:	ALL SAMPLES WERE PREPARED AND ANALYZED IN ACCORDANCE WITH THE NYSDOH ELAP "POLARIZED-LIGHT MICROSCOPE METHODS FOR IDENTIFYING AND QUANTITATING ASBESTOS IN BULK SAMPLES" ELAP ITEM 198.1, 04/14/10
INSTRUMENT:	OLYMPUS POLARIZED LIGHT MICROSCOPY, MODEL BH-2

ELAP#: 11236

BING LIANG
Laboratory Director

Approved Signatory

Report Prepared By:
Charlene Liang
7/21/2020 10:02 AM

KAM CONSULTANTS
35-40 36th Street
Long Island City
New York, 11106
Tel: (718) 729-1997
Fax: (718) 729-1876

ANALYSIS REPORT - ASBESTOS IN BULK SAMPLE

CLIENT: Niche Analysis, Inc.
PROJECT: West Chester Pump Station
PROJECT ADDRESS: Weaver Street, Fenimore RD, Country Club & Archville Pump S
CLIENT PROJECT INFO: Bidwell
DATE OF COLLECTION: 07/08/2020
Report ID: 196375 1
Date Revised 07/22/2020

CLIENT SAMPLE ID#	SAMPLE DESCRIPTION	Color	SAMPLE LOCATION	LAB ID#	ANALYTICAL METHOD	PLM RESULT			PLM NOB RESULT			TEM RESULT	COMMENTS	
						Asbestos Percentage and Type	Other Fiber Material Percentage and Type	Non-Fibrous Material Percentage and Type	Asbestos Percentage and Type	Other Fiber Material Percentage and Type	Non-Fibrous Material Percentage and Type	Asbestos Percentage and Type	1 LAYER	2 OR MORE LAYERS
WV-ASB-01	Grey Putty on Roof Vent Seam	Gray	Weaver St. PS, Exterior	196375-01	PLM & TEM NOB				NAD-INC			<1.0% CHR	X	
WV-ASB-02	Grey Putty on Roof Vent Seam	Gray	Weaver St. PS, Exterior	196375-02	PLM & TEM NOB				NAD-INC			<1.0% CHR	X	
WV-ASB-03	White Activator Gasket	White	Weaver St. PS, Exterior	196375-03	PLM & TEM NOB				NAD-INC			NAD	X	
WV-ASB-04	White Activator Gasket	White	Weaver St. PS, Exterior	196375-04	PLM & TEM NOB				NAD-INC			NAD	X	
WV-ASB-05	Grey Putty on Conduit	Gray	Weaver St. PS, Dry Well	196375-05	PLM & TEM NOB				NAD-INC			NAD	X	
WV-ASB-06	Grey Putty on Conduit	Gray	Weaver St. PS, Dry Well	196375-06	PLM & TEM NOB				NAD-INC			NAD	X	
WV-ASB-09	Grey HVAC Duct Sealant	Gray	Weaver St. PS, Dry Well	196375-07	PLM & TEM NOB				NAD-INC			NAD	X	
WV-ASB-10	Grey HVAC Duct Sealant	Gray	Weaver St. PS, Dry Well	196375-08	PLM & TEM NOB				NAD-INC			NAD	X	
WV-ASB-11	Black Rubber Gasket	Black	Weaver St. PS, Dry Well	196375-09	PLM & TEM NOB				NAD-INC			NAD	X	
WV-ASB-12	Black Rubber Gasket	Black	Weaver St. PS, Dry Well	196375-10	PLM & TEM NOB				NAD-INC			NAD	X	
WV-ASB-13	Red Rubber Gasket	Red	Weaver St. PS, Dry Well	196375-11	PLM & TEM NOB				NAD-INC			NAD	X	
WV-ASB-14	Red Rubber Gasket	Red	Weaver St. PS, Dry Well	196375-12	PLM & TEM NOB				NAD-INC			NAD	X	
FR-ASB-15	Black Roof Vent Sealant	Black	Fenimore Rd., Exterior	196375-13	PLM & TEM NOB				NAD-INC			NAD	X	
FR-ASB-16	Black Roof Vent Sealant	Black	Fenimore Rd., Exterior	196375-14	PLM & TEM NOB				NAD-INC			NAD	X	
FR-ASB-17	Black Roof Mastic	Black	Fenimore Rd., Exterior	196375-15	PLM NOB				3.8% CHR				X	
FR-ASB-18	Black Roof Mastic		Fenimore Rd., Exterior	196375-16	PLM NOB				ANR					
FR-ASB-19	Grey Putty around Conduit Penetrations	Gray	Fenimore Rd., Dry Well	196375-17	PLM NOB				2.1% CHR				X	
FR-ASB-20	Grey Putty around Conduit Penetrations		Fenimore Rd., Dry Well	196375-18	PLM NOB				ANR					
FR-ASB-21	Red Rubber Gasket	Red	Fenimore Rd., Dry Well	196375-19	PLM & TEM NOB				NAD-INC			NAD	X	
FR-ASB-22	Red Rubber Gasket	Red	Fenimore Rd., Dry Well	196375-20	PLM & TEM NOB				NAD-INC			NAD	X	

PLM Method of analysis ☐ NYS- DOH ELAP 198 1 ☒ NYS- DOH ELAP 198 6 ☐ 40 CFR PART 763 SUB F, APP E (EPA 600/M4/82/020)
TEM Method of Analysis NYS-DOH ELAP 198 4
*PLM RL=0.25% (RL represented by the detection of ones asbestos in 400 points) * TRACE= Asbestos appears in a field but does not be directly under a point. * TEM RL=1% * NAD= No asbestos detected * NAD-INC= No asbestos detected - Inconclusive
* ANR= Analysis not required * NA= Not analyzed due to residue <1 0% Sample are reported as Non- ACM * All PLM-NOB samples with 1% asbestos or less are "Inconclusive", TEM is the only method that can verify that a NOB is inconclusive result in PLM
CHR = Chrysotile, ACT = Actinolite, AMO = Amosite, ANTH = Anthophyllite, CROC = Crocidolite, TREM = Tremolite
The results relate only to the items calibrated or tested Samples will be stored for ninety (90) days and then returned to the client upon request. The certificate of report shall not reproduced without approval of the laboratory This report must not be used by the client to claim product, certification, approval, or endorsement by NVLAP, NIST or any agency of the Federal Government
TEM results are not covered by NVLAP and AIHA- LAP
*Samples condition upon receipt: Acceptable
*If the material contains greater than 10% Vermiculite, Item 198 6 from NYS DOH will be use for analysis. This method does not remove vermiculite and underestimate the level of asbestos in a sample containing greater than 10% vermiculite.

Analyst PLM: _____
Ruody Louis
Date of Analysis: 07/15/2020
NYS-DOH ELAP #: 11273

Analyst TEM: _____
Hao Wu
Date of Analysis: 07/16/2020
AIHA-LAP#: 100269

Laboratory Supervisor: _____
Hao Wu
Date of Report: 07/16/2020

NVLAP Lab Code: 102047-0

KAM CONSULTANTS
35-40 36th Street
Long Island City
New York, 11106
Tel: (718) 729-1997
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ANALYSIS REPORT - ASBESTOS IN BULK SAMPLE

CLIENT: Niche Analysis, Inc.
PROJECT: West Chester Pump Station
PROJECT ADDRESS: Weaver Street, Fenmore. RD, Country Club & Archville Pump S
CLIENT PROJECT INFO: Bidwell
DATE OF COLLECTION: 07/08/2020
Report ID: 196375.1
Date Revised: 07/22/2020

CLIENT SAMPLE ID#	SAMPLE DESCRIPTION	Color	SAMPLE LOCATION	LAB ID#	ANALYTICAL METHOD	PLM RESULT			PLM NOB RESULT			TEM RESULT	COMMENTS	
						Asbestos Percentage and Type	Other Fiber Material Percentage and Type	Non- Fibrous Material Percentage and Type	Asbestos Percentage and Type	Other Fiber Material Percentage and Type	Non- Fibrous Material Percentage and Type	Asbestos Percentage and Type	1 LAYER	2 OR MORE LAYERS
FR-ASB-23	Black Rubber Gasket on Pipe Patch	Black	Fenimore Rd., Dry Well	196375-21	PLM & TEM NOB				NAD-INC			NAD	X	
FR-ASB-24	Black Rubber Gasket on Pipe Patch	Black	Fenimore Rd., Dry Well	196375-22	PLM & TEM NOB				NAD-INC			NAD	X	
FR-ASB-25	White Gasket in Grey Pump	White	Fenimore Rd., Dry Well	196375-23	PLM & TEM NOB				NAD-INC			NAD	X	
FR-ASB-26	White Gasket in Grey Pump	White	Fenimore Rd., Dry Well	196375-24	PLM & TEM NOB				NAD-INC			NAD	X	
FR-ASB-27	Grey Pipe Penetration Packing	Gray	Fenmore Rd., Dry Well	196375-25	PLM & TEM NOB				NAD-INC			NAD	X	
FR-ASB-28	Grey Pipe Penetration Packing	Gray	Fenimore Rd., Dry Well	196375-26	PLM & TEM NOB				NAD-INC			NAD	X	
FR-ASB-31	Grey HVAC Duct Sealant	Gray	Fenimore Rd., Dry Well	196375-27	PLM & TEM NOB				NAD-INC			NAD	X	
FR-ASB-32	Grey HVAC Duct Sealant	Gray	Fenimore Rd., Dry Well	196375-28	PLM & TEM NOB				NAD-INC			NAD	X	
AR-ASB-33	Black Foam Gasket in Generator	Black	Archville Pump Station, Exterior	196375-29	PLM & TEM NOB				NAD-INC			NAD	X	
AR-ASB-34	Black Foam Gasket in Generator	Black	Archville Pump Station, Exterior	196375-30	PLM & TEM NOB				NAD-INC			NAD	X	
AR-ASB-35	Grey Caulk on Roof Vent Seam	Gray	Archville Pump Station, Exterior	196375-31	PLM & TEM NOB				NAD-INC			NAD	X	
AR-ASB-36	Grey Caulk on Roof Vent Seam	Gray	Archville Pump Station, Exterior	196375-32	PLM & TEM NOB				NAD-INC			NAD	X	
CCL-ASB-37	Grey Putty around Electrical Penetration	Gray	Country Club Lane PS, Panel	196375-33	PLM & TEM NOB				NAD-INC			NAD	X	
CCL-ASB-38	Grey Putty around Electrical Penetration	Gray	Country Club Lane PS, Panel	196375-34	PLM & TEM NOB				NAD-INC			NAD	X	

PLM Method of analysis ☐ NYS- DOH ELAP 198 1 ☒ NYS- DOH ELAP 198 6 ☐ 40 CFR PART 763 SUB E, APP E (EPA 600/M4/82/020)
TEM Method of Analysis: NYS-DOH ELAP 198 4
*PLM RL=0.25% (RL represented by the detection of ones asbestos in 400 points). * TRACE= Asbestos appears in a field but does not be directly under a point * TEM RL=1% * NAD= No asbestos detected * NAD-INC= No asbestos detected - Inconclusive
* ANR= Analysis not required * NA= Not analyzed due to residue <1.0%. Sample are reported as Non- ACM. * All PLM-NOB samples with 1% asbestos or less are "Inconclusive". TEM is the only method that can verify that a NOB is inconclusive result in PLM.
CHR = Chrysotile, ACT = Actinolite, AMO = Amosite, ANTH = Anthophyllite, CROC = Crocidolite, TREM = Tremolite
The results relate only to the items calibrated or tested. Samples will be stored for ninety (90) days and then returned to the client upon request. The certificate of report shall not reproduced without approval of the laboratory. This report must not be used by the client to claim product, certification, approval, or endorsement by NVLAP, NIST or any agency of the Federal Government.
TEM results are not covered by NVLAP and AIHA- LAP.
*Samples condition upon receipt Acceptable
*If the material contains greater than 10% Vermiculite, Item 198.6 from NYS DOH will be use for analysis. This method does not remove vermiculite and underestimate the level of asbestos in a sample containing greater than 10% vermiculite

Analyst PLM: _____
Roody Louis
Date of Analysis: 07/15/2020
NYS-DOH ELAP #: 11273

Analyst TEM: _____
Hao Wu
Date of Analysis: 07/16/2020
AIHA-LAP#: 100269

Laboratory Supervisor: _____
Hao Wu
Date of Report: 07/16/2020

NVLAP Lab Code: 102047-0

196375

21-95270-2

NICHE ANALYSIS, INC.
399 Knollwood Road, Suite 208
White Plains, NY 10603
914-288-0505
914-288-0507 (Fax)

TURN AROUND TIME:
☐ RUSH ☐ 6 HRS ☐ 24 HRS ☒ OTHER STANDARD

ASBESTOS FIELD SURVEY DATA SHEET / BULK SAMPLE LOG

PAGE 1 OF 5

RECEIVED
KAH CONSULTANTS
2020 JUL 14 P 3:48

PROJECT NO.: WESTCHESTER PUMP STATIONS
CLIENT: BIDWELL
PROJECT SITE: WEAVER ST. FEMMORE RD, COUNTRY CLUB + ARCHVILLE PUMP STATIONS
INVESTIGATOR:

LOCATION(S) SURVEYED: WEAVER ST, FEMMORE RD, COUNTRY CLUB + ARCHVILLE PUMP STATIONS
SCOPE OF WORK: COMPLETE RENOVATION
INSPECTOR: MICHAEL WELLOCK DATE(S) OF INSPECTION: 7/8/20

FUNCTIONAL SPACE FLOOR	FUNCTIONAL SPACE AREA DESCRIPTION	SAMPLE # OR ASSUMED	HOMOGENEOUS HID	HOMOGENEOUS MATERIAL DESCRIPTION	QUANTITY (LF/SF)	ASSESSMENT COND (1,2,3,4,5,6,7 G MD P)	ASSESSMENT FRIAB (F NF)	ASBESTOS CONTENT %
	WEAVER ST. PS, EXTERIOR	WV-ASB-01	01	GREY PUTTY ON ROOF VENT SEAM		1,2,3,4,5,6,7 G MD P	F NF	PLM: TEM:
	WEAVER ST. PS, EXTERIOR	WV-ASB-02	01	GREY PUTTY ON ROOF VENT SEAM		1,2,3,4,5,6,7 G MD P	F NF	PLM: TEM:
	WEAVER ST. PS, EXTERIOR	WV-ASB-03	02	WHITE ACTUATOR GASKET		1,2,3,4,5,6,7 G MD P	F NF	PLM: TEM:
	WEAVER ST. PS, EXTERIOR	WV-ASB-04	02	WHITE ACTUATOR GASKET		1,2,3,4,5,6,7 G MD P	F NF	PLM: TEM:
	WEAVER ST. PS, DRY WELL	WV-ASB-05	03	GREY PUTTY ON CONDUIT		1,2,3,4,5,6,7 G MD P	F NF	PLM: TEM:
	WEAVER ST. PS, DRY WELL	WV-ASB-06	03	GREY PUTTY ON CONDUIT		1,2,3,4,5,6,7 G MD P	F NF	PLM: TEM:
	WEAVER ST. PS, DRY WELL	WV-ASB-07	04	GREY CONCRETE CONDUIT PENETRATION		1,2,3,4,5,6,7 G MD P	F NF	PLM: TEM:
	WEAVER ST. PS, DRY WELL	WV-ASB-08	04	GREY CONCRETE CONDUIT PENETRATION		1,2,3,4,5,6,7 G MD P	F NF	PLM: TEM:
	WEAVER ST. PS, DRY WELL	WV-ASB-09	05	GREY HVAC DUCT SEALANT		1,2,3,4,5,6,7 G MD P	F NF	PLM: TEM:

PHYSICAL CONDITION ASSESSMENT
1 Damaged or Significantly Damaged Friable TSI
2 Damaged Friable Surfacing ACM
3 Significantly Damaged Friable Surfacing ACM
4 Damaged or Significantly Damaged Friable Misc. ACM
5 ACBM with potential for Damage
6 ACBM with potential for Significant Damage
7 Remaining Friable or Suspect ACBM
G – Good / MD – Minor Damage / P - Poor

FRIABLE: Yes (Y) / No (N)

PLM - POLARIZED LIGHT MICROSCOPY TEM - TRANSMISSION ELECTRON MICROSCOPY

RELINQUISHED BY: DATE: 7/10/20 TIME: 1:32
RECEIVED BY: DATE: 7/10/20 TIME:
RELINQUISHED BY: DATE: 7/14/20 TIME:
RECEIVED BY: DATE: 7/14/2020 TIME: 3:48 PM

NYSDOL INSPECTOR CERTIFICATE NO.: 12-14716
TELEPHONE NO.
ADDRESS:

1. A visual determination of accessible suspect materials and condition.
2. Collect bulk samples of suspect building materials.
3. A physical "Hand Pressure" test for determining friability and condition.
4. Assessment of suspect friable and non-friable materials and locations.
5. Quantify the amount of suspect materials in their respective locations.
6. Submit bulk samples for analysis by PLM and/or TEM Method.
7. Bulk Sample locations and suspect materials were identified on the appropriate building floor plan diagram with the sample number.
8. A Chain of Custody record accompanied the samples to the laboratory.

FIELD NOTES: Not Submitted

ANALYZE: ☐ ALL ☒ STOP AT FIRST POSITIVE ☐ PLM ☒ TEM (36)

DAA 7/15/20 AL

ZC-255702

NICHE ANALYSIS, INC.
399 Knollwood Road, Suite 208
White Plains, NY 10603
914-288-0805
914-288-0807 (Fax)

TURN AROUND TIME:
☐ RUSH ☐ 6 HRS ☐ 24 HRS ☑ OTHER STANDARD

ASBESTOS FIELD SURVEY DATA SHEET / BULK SAMPLE LOG

PROJECT NO.:
CLIENT: BIDWELL
PROJECT SITE: WEAVER ST., FENIMORE RD, COUNTRY CLUB + ARLINVILLE PUMP STATIONS
INVESTIGATOR:

LOCATION(S) SURVEYED: WEAVER ST., FENIMORE RD, COUNTRY CLUB + ARLINVILLE PUMP STATIONS
SCOPE OF WORK: COMPLETE RENOVATION
INSPECTOR: MICHAEL WELLBROCK DATE(S) OF INSPECTION: 7/8/20

FUNCTIONAL SPACE		SAMPLE # OR ASSUMED	HOMOGENEOUS		QUANTITY	ASSESSMENT		ASBESTOS CONTENT
FLOOR	AREA DESCRIPTION		HID	MATERIAL DESCRIPTION	(LF/SF)	COND	FRIAB	%
	WEAVER ST. PS, DRY WELL	WV-ASB-10	05	GREY HVAC DUCT SEALANT		1, 2, 3, 4, 5, 6, 7 G M D P	F NF	PLM: TEM:
	WEAVER ST. PS, DRY WELL	WV-ASB-11	06	BLACK RUBBER GASKET		1, 2, 3, 4, 5, 6, 7 G M D P	F NF	PLM: TEM:
	WEAVER ST. PS, DRY WELL	WV-ASB-12	06	BLACK RUBBER GASKET		1, 2, 3, 4, 5, 6, 7 G M D P	F NF	PLM: TEM:
	WEAVER ST. PS, DRY WELL	WV-ASB-13	07	RED RUBBER GASKET		1, 2, 3, 4, 5, 6, 7 G M D P	F NF	PLM: TEM:
	WEAVER ST. PS, DRY WELL	WV-ASB-14	07	RED RUBBER GASKET		1, 2, 3, 4, 5, 6, 7 G M D P	F NF	PLM: TEM:
	FENIMORE RD., EXTERIOR	FR-ASB-15	08	BLACK ROOF VENT SEALANT		1, 2, 3, 4, 5, 6, 7 G M D P	F NF	PLM: TEM:
	FENIMORE RD, EXTERIOR	FR-ASB-16	08	BLACK ROOF VENT SEALANT		1, 2, 3, 4, 5, 6, 7 G M D P	F NF	PLM: TEM:
	FENIMORE RD., EXTERIOR	FR-ASB-17	09	BLACK ROOF MASTIC		1, 2, 3, 4, 5, 6, 7 G M D P	F NF	PLM: TEM:
	FENIMORE RD, EXTERIOR	FR-ASB-18	09	BLACK ROOF MASTIC		1, 2, 3, 4, 5, 6, 7 G M D P	F NF	PLM: TEM:

PHYSICAL CONDITION ASSESSMENT
1 Damaged or Significantly Damaged Friable TSI
2 Damaged Friable Surfacing ACM
3 Significantly Damaged Friable Surfacing ACM
4 Damaged or Significantly Damaged Friable Misc. ACM
5 ACBM with potential for Damage
6 ACBM with potential for Significant Damage
7 Femishing Friable or Suspect ACBM
G – Good / MD – Minor Damage / P - Poor

FRIABLE
Yes (Y)
No (N)

PLM - POLARIZED LIGHT MICROSCOPY TEM - TRANSMISSION ELECTRON MICROSCOPY

RELINQUISHED BY: [signature] DATE: 7/10/20 TIME: 9:30
RECEIVED BY: [signature] DATE: 7/10/20 TIME:
RELINQUISHED BY: [signature] DATE: 7/14/20 TIME:
RECEIVED BY: Heather King DATE: 7/14/2020 TIME: 3:48PM

NYSDOL INSPECTOR:
CERTIFICATE NO.:
TELEPHONE NO.
ADDRESS:

1. A visual determination of accessible suspect materials and condition.
2. Collect bulk samples of suspect building materials.
3. A physical "Hand Pressure" test for determining friability and condition.
4. Assessment of suspect friable and non-friable materials and locations.
5. Quantify the amount of suspect materials in their respective locations.
6. Submit bulk samples for analysis by PLM and/or TEM Method.
7. Bulk Sample locations and suspect materials were identified on the appropriate building floor plan diagram with the sample number.
8. A Chain of Custody record accompanied the samples to the laboratory.

FIELD NOTES:

ANALYZE: ☐ ALL ☒ STOP AT FIRST POSITIVE ☐ PLM ☐ TEM

23-25270-2

NICHE ANALYSIS, INC.
399 Knollwood Road, Suite 208
White Plains, NY 10603
914-288-0805
914-288-0807 (Fax)

TURN AROUND TIME:
☐ RUSH ☐ 6 HRS ☐ 24 HRS ☒ OTHER STANDARD

ASBESTOS FIELD SURVEY DATA SHEET / BULK SAMPLE LOG

PAGE 3 OF 5

PROJECT NO.:
CLIENT: BIDWELL
PROJECT SITE: WEAVER ST., FENIMORE RD., COUNTRY CLUB + ARLINGTON PUMP STATIONS
INVESTIGATOR:

LOCATION(S) SURVEYED: WEAVER ST., FENIMORE RD, COUNTRY CLUB - ARLINGTON PUMP STATIONS
SCOPE OF WORK: COMPLETE RENOVATION
INSPECTOR: MICHAEL WELLOCK DATE(S) OF INSPECTION: 7/8/20

FUNCTIONAL SPACE		SAMPLE # OR ASSUMED	HOMOGENEOUS		QUANTITY	ASSESSMENT		ASBESTOS CONTENT
FLOOR	AREA DESCRIPTION		HID	MATERIAL DESCRIPTION	(LF/SF)	COND	FRIAB	%
	FENIMORE RD, ~~EXTERIOR~~ DRY WELL	FR-ASB -19	10	GREY PUTTY AROUND CONDUIT PENETRATIONS		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	FENIMORE RD., ~~EXTERIOR~~ DRY WELL	FR-ASB -20	10	GREY PUTTY AROUND CONDUIT PENETRATIONS		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	FENIMORE RD., DRY WELL	FR-ASB -21	11	RED RUBBER GASKET		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	FENIMORE RD., DRY WELL	FR-ASB -22	11	RED RUBBER GASKET		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	FENIMORE RD, DRY WELL	FR-ASB -23	12	BLACK RUBBER GASKET ON PIPE PATCH		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	FENIMORE RD., DRY WELL	FR-ASB -24	12	BLACK RUBBER GASKET ON PIPE PATCH		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	FENIMORE RD., DRY WELL	FR-ASB -25	13	WHITE GASKET IN GREY PUMP		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	FENIMORE RD., DRY WELL	FR-ASB -26	13	WHITE GASKET IN GREY PUMP		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	FENIMORE RD., DRY WELL	FR-ASB -27	14	GREY PIPE PENETRATION PACKING		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:

PHYSICAL CONDITION ASSESSMENT: 1 Damaged or Significantly Damaged Friable ACM; 2 Damaged Friable Surfacing ACM; 3 Significantly Damaged Friable Surfacing ACM; 4 Damaged or Significantly Damaged Friable Misc. ACM; 5 ACBM with potential for Damage; 6 ACBM with potential for Significant Damage; 7 Functioning Friable or Suspect ACBM; G – Good / ND – Minor Damage / P - Poor

FRIABLE: Yes (Y) No (N)

PLM - POLARIZED LIGHT MICROSCOPY TEM - TRANSMISSION ELECTRON MICROSCOPY

RELINQUISHED BY: _____ DATE: 7/10/20 TIME: 9:30
RECEIVED BY: _____ DATE: 7/13/20 TIME: _____
RELINQUISHED BY: _____ DATE: 7/14/20 TIME: _____
RECEIVED BY: _____ DATE: 7/14/2020 TIME: 3:48 PM

NYSDOL INSPECTOR CERTIFICATE NO.:
TELEPHONE NO
ADDRESS

1. A visual determination of accessible suspect materials and condition.
2. Collect bulk samples of suspect building materials.
3. A physical "Hand Pressure" test for determining friability and condition.
4. Assessment of suspect friable and non-friable materials and locations.
5. Quantify the amount of suspect materials in their respective locations.
6. Submit bulk samples for analysis by PLM and/or TEM Method.
7. Bulk Sample locations and suspect materials were identified on the appropriate building floor plan diagram with the sample number.
8. A Chain of Custody record accompanies the samples to the laboratory.

FIELD NOTES:

ANALYZE: ☐ ALL ☒ STOP AT FIRST POSITIVE ☐ PLM ☐ TEM

NICHE ANALYSIS, INC.
399 Knollwood Road, Suite 208
White Plains, NY 10603
914-288-0805
914-288-0807 (Fax)

Z- L52702

TURN AROUND TIME:
☐ RUSH ☐ 6 HRS ☐ 24 HRS ☒ OTHER STANDARD

ASBESTOS FIELD SURVEY DATA SHEET / BULK SAMPLE LOG

PAGE 4 OF 5

PROJECT NO.:
CLIENT: BIDWELL
PROJECT SITE: WEAVER ST., FENIMORE RD, COUNTRY CLUB & ARCHVILLE PUMP STATIONS
INVESTIGATOR:

LOCATION(S) SURVEYED: WEAVER ST., FENIMORE RD., COUNTRY CLUB & ARCHVILLE PUMP STATIONS
SCOPE OF WORK: COMPLETE RENOVATION
INSPECTOR: MICHAEL WELLOCK DATE(S) OF INSPECTION: 7/8/20

FUNCTIONAL SPACE		SAMPLE # OR ASSUMED	HOMOGENEOUS		QUANTITY	ASSESSMENT		ASBESTOS CONTENT
FLOOR	AREA DESCRIPTION		HID	MATERIAL DESCRIPTION	(LF/SF)	COND	FRIAB	%
	FENIMORE RD., DRY WELL	FR-ASB-28	14	GREY PIPE PENETRATION PACKING		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	FENIMORE RD., DRY WELL	FR-ASB-29	15	GREY FIBROUS GASKET IN BLUE PUMP		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	FENIMORE RD., DRY WELL	FR-ASB-30	15	GREY FIBROUS GASKET IN BLUE PUMP		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	FENIMORE RD., DRY WELL	FR-ASB-31	16	GREY HVAC DUCT SEALANT		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	FENIMORE RD., DRY WELL	FR-ASB-32	16	GREY HVAC DUCT SEALANT		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	ARCHVILLE PUMP STATION, EXTERIOR	AR-ASB-33	17	BLACK FOAM GASKET IN GENERATOR		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	ARCHVILLE PUMP STATION, EXTERIOR	AR-ASB-34	17	BLACK FOAM GASKET IN GENERATOR		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	ARCHVILLE PUMP STATION, EXTERIOR	AR-ASB-35	18	GREY CAULK ON ROOF VENT SEAM		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	ARCHVILLE PUMP STATION, EXTERIOR	AR-ASB-36	18	GREY CAULK ON ROOF VENT SEAM		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:

PHYSICAL CONDITION ASSESSMENT
1 Damaged or Significantly Damaged Friable ACM
2 Damaged Friable Surfacing ACM
3 Significantly Damaged Friable Surfacing ACM
4 Damaged or Significantly Damaged Friable Misc. ACM
5 ACBM with potential for Damage
6 ACBM with potential for Significant Damage
7 Formerly Friable or Suspect ACBM
G – Good / MD – Minor Damage / P - Poor

FRIABLE: Yes (Y) No (N)

PLM - POLARIZED LIGHT MICROSCOPY TEM - TRANSMISSION ELECTRON MICROSCOPY

RELINQUISHED BY: _____ DATE: 7/10/20 TIME: 9:30
RECEIVED BY: _____ DATE: 7/11/20 TIME: _____
RELINQUISHED BY: _____ DATE: 7/14/20 TIME: _____
RECEIVED BY: _____ DATE: 7/14/2020 TIME: 3:48PM

NYSDOL INSPECTOR:
CERTIFICATE NO.:
TELEPHONE NO
ADDRESS

1. A visual determination of accessible suspect materials and condition.
2. Collect bulk samples of suspect building materials.
3. A physical "Hand Pressure" test for determining friability and condition.
4. Assessment of suspect friable and non-friable materials and locations.
5. Quantify the amount of suspect materials in their respective locations.
6. Submit bulk samples for analysis by PLM and/or TEM Method.
7. Bulk Sample locations and suspect materials were identified on the appropriate building floor plan diagram with the sample number.
8. A Chain of Custody record accompanied the samples to the laboratory.

FIELD NOTES:

ANALYZE: ☐ ALL ☒ STOP AT FIRST POSITIVE ☐ PLM ☐ TEM

BC- 25270-2

NICHE ANALYSIS, INC.
399 Knollwood Road, Suite 208
White Plains, NY 10603
914-288-0805
914-288-0807 (Fax)

TURN AROUND TIME:
☐ RUSH ☐ 6 HRS ☐ 24 HRS ☒ OTHER STANDARD

ASBESTOS FIELD SURVEY DATA SHEET / BULK SAMPLE LOG

PAGE 5 OF 5

PROJECT NO.:
CLIENT: BIDWELL
PROJECT SITE: WEAVER ST., FENIMORE RD, COUNTRY CLUB + ARMVILLE POMP STATIONS
INVESTIGATOR:

LOCATION(S) SURVEYED: WEAVER ST, FENIMORE RD., COUNTRY CLUB + ARMVILLE POMP STATIONS
SCOPE OF WORK: COMPLETE RENOVATION
INSPECTOR: MICHAEL WELLOCK DATE(S) OF INSPECTION: 7/8/20

FUNCTIONAL SPACE		SAMPLE # OR ASSUMED	HOMOGENEOUS		QUANTITY	ASSESSMENT		ASBESTOS CONTENT
FLOOR	AREA DESCRIPTION		HID	MATERIAL DESCRIPTION	(LF/SF)	COND	FRIAB	%
	COUNTRY CLUB LANE PS, PANEL	CCL-ASB -37	19	GREY PUTTY AROUND ELECTRICAL PENETRATION		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
	COUNTRY CLUB LANE PS, PANEL	CCL-ASB -38	19	GREY PUTTY AROUND ELECTRICAL PENETRATION		1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
						1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
						1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
						1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
						1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
						1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
						1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:
						1, 2, 3, 4, 5, 6, 7 G MD P	F NF	PLM: TEM:

PHYSICAL CONDITION ASSESSMENT
1 Damaged or Significantly Damaged Friable ACM
2 Damaged Friable Surfacing ACM
3 Significantly Damaged Friable Surfacing ACM
4 Damaged or Significantly Damaged Friable Misc. ACM
5 ACBM with potential for Damage
6 ACBM with potential for Significant Damage
7 Femodeling Friable or Suspect ACBM
G – Good / MD – Minor Damage / P -Poor

FRIABLE
Yes (Y)
No (N)

PLM - POLARIZED LIGHT MICROSCOPY TEM - TRANSMISSION ELECTRON MICROSCOPY

RELINQUISHED BY: [signature] DATE: 7/10/20 TIME: 9-30
RECEIVED BY: [signature] DATE: 7/13/20 TIME:
RELINQUISHED BY: [signature] DATE: 7/14/20 TIME:
RECEIVED BY: [signature] DATE: 7/16/2020 TIME: 3:48 PM

NYSDOL INSPECTOR:
CERTIFICATE NO.:
TELEPHONE NO.:
ADDRESS:

1. A visual determination of accessible suspect materials and condition.
2. Collect bulk samples of suspect building materials.
3. A physical "Hand Pressure" test for determining friability and condition.
4. Assessment of suspect friable and non-friable materials and locations.
5. Quantify the amount of suspect materials in their respective locations.
6. Submit bulk samples for analysis by PLM and/or TEM Method.
7. Bulk Sample locations and suspect materials were identified on the appropriate building floor plan diagram with the sample number.
8. A Chain of Custody record accompanied the samples to the laboratory.

FIELD NOTES:

ANALYZE: ☐ ALL ☒ STOP AT FIRST POSITIVE ☐ PLM ☐ TEM

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2021
Issued April 01, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. BRIAN W. WOOD
AQUA PROTECH
1275 BLOOMFIELD AVE - BLDG 6
FAIRFIELD, NJ 07004

NY Lab Id No: 11634

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Acrylates	
Acrolein (Propenal)	EPA 8260C
Acrylonitrile	EPA 8260C
Amines	
2-Nitroaniline	EPA 8270D
3-Nitroaniline	EPA 8270D
4-Chloroaniline	EPA 8270D
4-Nitroaniline	EPA 8270D
Aniline	EPA 8270D
Carbazole	EPA 8270D
Benzidines	
3,3'-Dichlorobenzidine	EPA 8270D
Benzidine	EPA 8270D
Characteristic Testing	
Corrosivity (pH)	EPA 9040C
Ignitability	EPA 1010A
TCLP	EPA 1311
Chlorinated Hydrocarbon Pesticides	
4,4'-DDD	EPA 8081B
4,4'-DDE	EPA 8081B
4,4'-DDT	EPA 8081B
Aldrin	EPA 8081B
alpha-BHC	EPA 8081B
Atrazine	EPA 8270D
beta-BHC	EPA 8081B

Chlorinated Hydrocarbon Pesticides	
Chlordane Total	EPA 8081B
delta-BHC	EPA 8081B
Dieldrin	EPA 8081B
Endosulfan I	EPA 8081B
Endosulfan II	EPA 8081B
Endosulfan sulfate	EPA 8081B
Endrin	EPA 8081B
Endrin aldehyde	EPA 8081B
Endrin Ketone	EPA 8081B
Heptachlor	EPA 8081B
Heptachlor epoxide	EPA 8081B
Lindane	EPA 8081B
Methoxychlor	EPA 8081B
Toxaphene	EPA 8081B
Chlorinated Hydrocarbons	
1,2,4-Trichlorobenzene	EPA 8270D
2-Chloronaphthalene	EPA 8270D
Hexachlorobenzene	EPA 8270D
Hexachlorobutadiene	EPA 8270D
Hexachlorocyclopentadiene	EPA 8270D
Hexachloroethane	EPA 8270D
Chlorophenoxy Acid Pesticides	
2,4,5-TP (Silvex)	EPA 8151A
2,4-D	EPA 8151A

Serial No.: 61870

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.

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Haloethers	
2,2'-Oxybis(1-chloropropane)	EPA 8270D
4-Bromophenylphenyl ether	EPA 8270D
4-Chlorophenylphenyl ether	EPA 8270D
Bis(2-chloroethoxy)methane	EPA 8270D
Bis(2-chloroethyl)ether	EPA 8270D
Metals I	
Barium, Total	EPA 6010C
Cadmium, Total	EPA 6010C
Calcium, Total	EPA 6010C
Chromium, Total	EPA 6010C
Copper, Total	EPA 6010C
Iron, Total	EPA 6010C
Lead, Total	EPA 6010C
Magnesium, Total	EPA 6010C
Manganese, Total	EPA 6010C
Nickel, Total	EPA 6010C
Potassium, Total	EPA 6010C
Silver, Total	EPA 6010C
Sodium, Total	EPA 6010C
Metals II	
Aluminum, Total	EPA 6010C
Antimony, Total	EPA 6010C
Arsenic, Total	EPA 6010C
Beryllium, Total	EPA 6010C
Chromium VI	EPA 7196A
Metals II	
Mercury, Total	EPA 7471B
Selenium, Total	EPA 6010C
Vanadium, Total	EPA 6010C
Zinc, Total	EPA 6010C
Metals III	
Cobalt, Total	EPA 6010C
Molybdenum, Total	EPA 6010C
Thallium, Total	EPA 6010C
Minerals	
Chloride	EPA 9056A
Fluoride, Total	EPA 9056A
Sulfate (as SO4)	EPA 9056A
Miscellaneous	
Cyanide, Total	EPA 9014
Nitroaromatics and Isophorone	
2,4-Dinitrotoluene	EPA 8270D
2,6-Dinitrotoluene	EPA 8270D
Isophorone	EPA 8270D
Nitrobenzene	EPA 8270D
Nitrosoamines	
N-Nitrosodimethylamine	EPA 8270D
N-Nitrosodiphenylamine	EPA 8270D

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Nutrients	
Nitrate (as N)	EPA 9056A
Nitrite (as N)	EPA 9056A
Petroleum Hydrocarbons	
Diesel Range Organics	EPA 8015D
Gasoline Range Organics	EPA 8015D
Oil and Grease Total Recoverable (HEM)	EPA 9071B (Solvent:Hexane)
Phthalate Esters	
Benzyl butyl phthalate	EPA 8270D
Bis(2-ethylhexyl) phthalate	EPA 8270D
Diethyl phthalate	EPA 8270D
Dimethyl phthalate	EPA 8270D
Di-n-butyl phthalate	EPA 8270D
Di-n-octyl phthalate	EPA 8270D
Polychlorinated Biphenyls	
Aroclor 1016 (PCB-1016)	EPA 8082A
Aroclor 1221 (PCB-1221)	EPA 8082A
Aroclor 1232 (PCB-1232)	EPA 8082A
Aroclor 1242 (PCB-1242)	EPA 8082A
Aroclor 1248 (PCB-1248)	EPA 8082A
Aroclor 1254 (PCB-1254)	EPA 8082A
Aroclor 1260 (PCB-1260)	EPA 8082A
Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A

Polynuclear Aromatic Hydrocarbons	
Acenaphthene	EPA 8270D
Acenaphthylene	EPA 8270D
Anthracene	EPA 8270D
Benzo(a)anthracene	EPA 8270D
Benzo(a)pyrene	EPA 8270D
Benzo(b)fluoranthene	EPA 8270D
Benzo(g,h,i)perylene	EPA 8270D
Benzo(k)fluoranthene	EPA 8270D
Chrysene	EPA 8270D
Dibenzo(a,h)anthracene	EPA 8270D
Fluoranthene	EPA 8270D
Fluorene	EPA 8270D
Indeno(1,2,3-cd)pyrene	EPA 8270D
Naphthalene	EPA 8270D
Phenanthrene	EPA 8270D
Pyrene	EPA 8270D
Priority Pollutant Phenols	
2,4,5-Trichlorophenol	EPA 8270D
2,4,6-Trichlorophenol	EPA 8270D
2,4-Dichlorophenol	EPA 8270D
2,4-Dimethylphenol	EPA 8270D
2,4-Dinitrophenol	EPA 8270D
2-Chlorophenol	EPA 8270D
2-Methyl-4,6-dinitrophenol	EPA 8270D
2-Methylphenol	EPA 8270D

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FAIRFIELD, NJ 07004

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All approved analytes are listed below:

Priority Pollutant Phenols	
2-Nitrophenol	EPA 8270D
3-Methylphenol	EPA 8270D
4-Chloro-3-methylphenol	EPA 8270D
4-Methylphenol	EPA 8270D
4-Nitrophenol	EPA 8270D
Pentachlorophenol	EPA 8270D
Phenol	EPA 8270D
Semi-Volatile Organics	
1,1'-Biphenyl	EPA 8270D
1,2-Dichlorobenzene, Semi-volatile	EPA 8270D
1,3-Dichlorobenzene, Semi-volatile	EPA 8270D
1,4-Dichlorobenzene, Semi-volatile	EPA 8270D
2-Methylnaphthalene	EPA 8270D
Acetophenone	EPA 8270D
Benzaldehyde	EPA 8270D
Benzoic Acid	EPA 8270D
Benzyl alcohol	EPA 8270D
Caprolactam	EPA 8270D
Dibenzofuran	EPA 8270D
Volatile Aromatics	
1,2,4-Trichlorobenzene, Volatile	EPA 8260C
1,2,4-Trimethylbenzene	EPA 8260C
1,2-Dichlorobenzene	EPA 8260C
1,3,5-Trimethylbenzene	EPA 8260C
1,3-Dichlorobenzene	EPA 8260C

Volatile Aromatics	
1,4-Dichlorobenzene	EPA 8260C
2-Chlorotoluene	EPA 8260C
4-Chlorotoluene	EPA 8260C
Benzene	EPA 8260C
Bromobenzene	EPA 8260C
Chlorobenzene	EPA 8260C
Ethyl benzene	EPA 8260C
Isopropylbenzene	EPA 8260C
Naphthalene, Volatile	EPA 8260C
n-Butylbenzene	EPA 8260C
n-Propylbenzene	EPA 8260C
p-Isopropyltoluene (P-Cymene)	EPA 8260C
sec-Butylbenzene	EPA 8260C
Styrene	EPA 8260C
tert-Butylbenzene	EPA 8260C
Toluene	EPA 8260C
Total Xylenes	EPA 8260C
Volatile Halocarbons	
1,1,1,2-Tetrachloroethane	EPA 8260C
1,1,1-Trichloroethane	EPA 8260C
1,1,2,2-Tetrachloroethane	EPA 8260C
1,1,2-Trichloro-1,2,2-Trifluoroethane	EPA 8260C
1,1,2-Trichloroethane	EPA 8260C
1,1-Dichloroethane	EPA 8260C
1,1-Dichloroethene	EPA 8260C

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FAIRFIELD, NJ 07004

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All approved analytes are listed below:

Volatile Halocarbons	
1,2,3-Trichloropropane	EPA 8260C
1,2-Dibromo-3-chloropropane	EPA 8260C
1,2-Dibromoethane	EPA 8260C
1,2-Dichloroethane	EPA 8260C
1,2-Dichloropropane	EPA 8260C
1,3-Dichloropropane	EPA 8260C
2-Chloroethylvinyl ether	EPA 8260C
Bromochloromethane	EPA 8260C
Bromodichloromethane	EPA 8260C
Bromoform	EPA 8260C
Bromomethane	EPA 8260C
Carbon tetrachloride	EPA 8260C
Chloroethane	EPA 8260C
Chloroform	EPA 8260C
Chloromethane	EPA 8260C
cis-1,2-Dichloroethene	EPA 8260C
cis-1,3-Dichloropropene	EPA 8260C
Dibromochloromethane	EPA 8260C
Dibromomethane	EPA 8260C
Dichlorodifluoromethane	EPA 8260C
Hexachlorobutadiene, Volatile	EPA 8260C
Methylene chloride	EPA 8260C
Tetrachloroethene	EPA 8260C
trans-1,2-Dichloroethene	EPA 8260C
trans-1,3-Dichloropropene	EPA 8260C
Trichloroethene	EPA 8260C
Volatile Halocarbons	
Trichlorofluoromethane	EPA 8260C
Vinyl chloride	EPA 8260C
Volatile Organics	
1,4-Dioxane	EPA 8270D
2-Butanone (Methylethyl ketone)	EPA 8260C
2-Hexanone	EPA 8260C
4-Methyl-2-Pentanone	EPA 8260C
Acetone	EPA 8260C
Carbon Disulfide	EPA 8260C
Cyclohexane	EPA 8260C
Methyl cyclohexane	EPA 8260C
Methyl tert-butyl ether	EPA 8260C
tert-butyl alcohol	EPA 8260C
Sample Preparation Methods	
	EPA 5035A-L
	EPA 5035A-H
	EPA 3040A
	EPA 3050B
	EPA 3550C
	EPA 3060A
	EPA 9010C

Serial No.: 61870

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

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Issued April 01, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

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MR. BING LIANG
NICHE ANALYSIS INC
399 KNOLLWOOD ROAD SUITE 208
WHITE PLAINS, NY 10603

NY Lab Id No: 11236

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

NEW YORK STATE | Department of Health

Serial No.: 61308

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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

Niche Analysis, Inc.
Suite 208
399 Knollwood Road

White Plains, NY 10603

FILE NUMBER: 99-0933
LICENSE NUMBER: 28914
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 12/26/2019
EXPIRATION DATE: 12/31/2020

Duly Authorized Representative – Bing Liang:

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 HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2021
Issued April 01, 2020

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. GEORGE KOUVARAS
KAM CONSULTANTS
35-40 36TH ST
LONG ISLAND CITY, NY 11106

NY Lab Id No: 11273

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	EPA 7000B

Sample Preparation Methods

	EPA 3050B
	ASTM E-1979-17

Serial No.: 61321

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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

KAM Consultants Corp.

35-40 36th Street

Long Island Cty, NY 11106

FILE NUMBER: 99-0898
LICENSE NUMBER: 28659
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 10/07/2019
EXPIRATION DATE: 10/31/2020

Duly Authorized Representative – Elizabeth Poulios Kouvaras:

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.

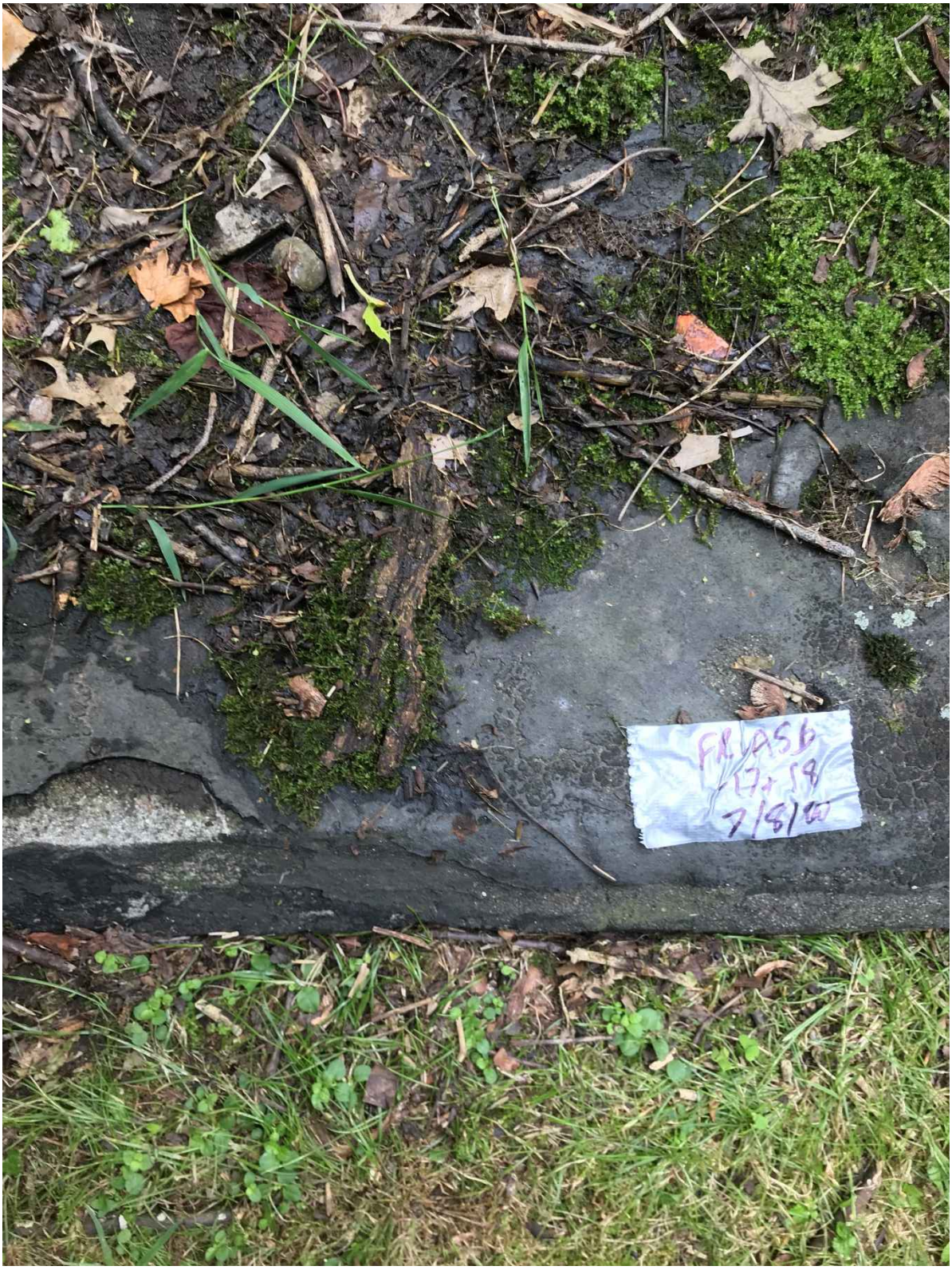
Eileen M. Franko, Director
For the Commissioner of Labor

SH 432 (8/12)

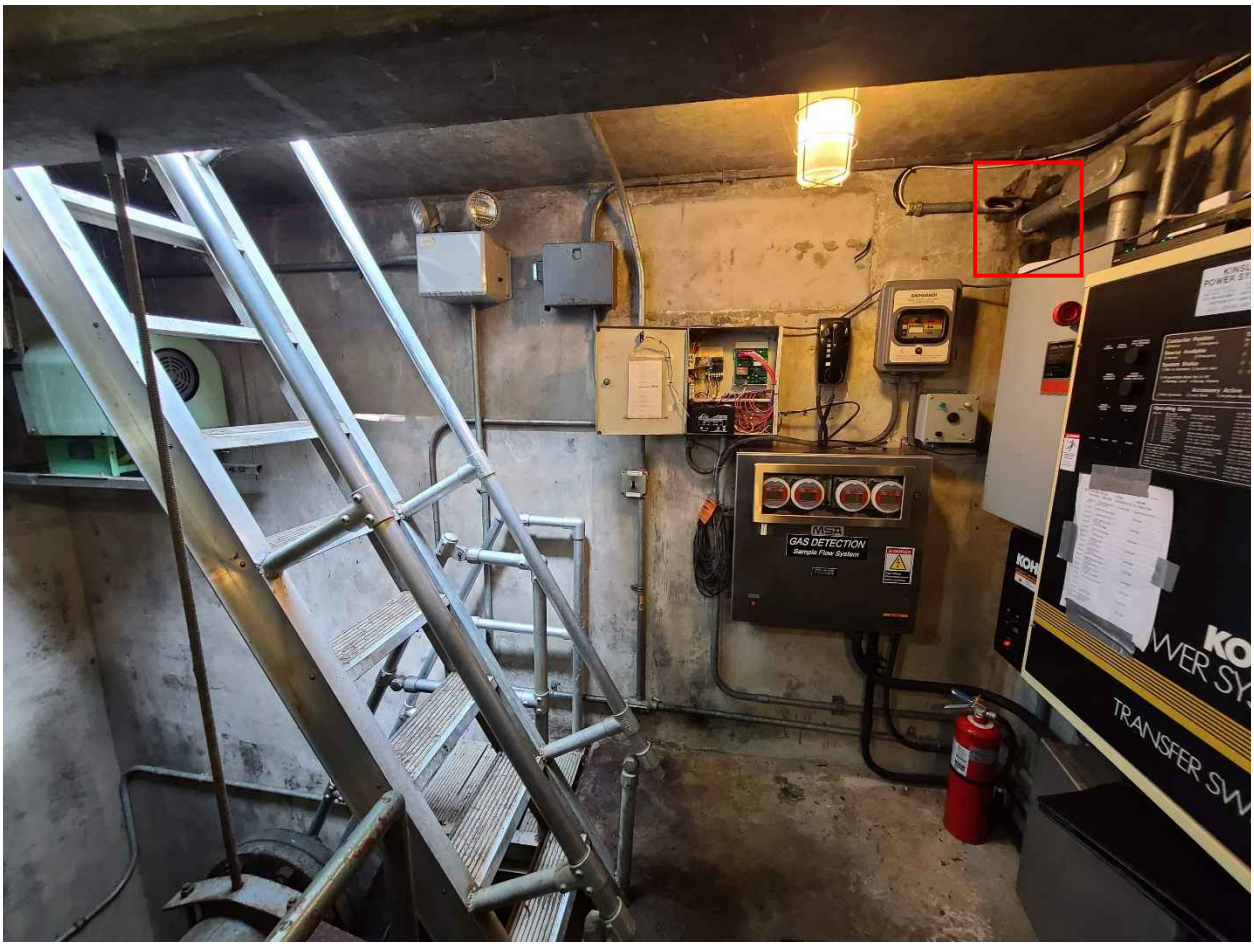
ATTACHMENT B

Hazardous Materials Photo Log

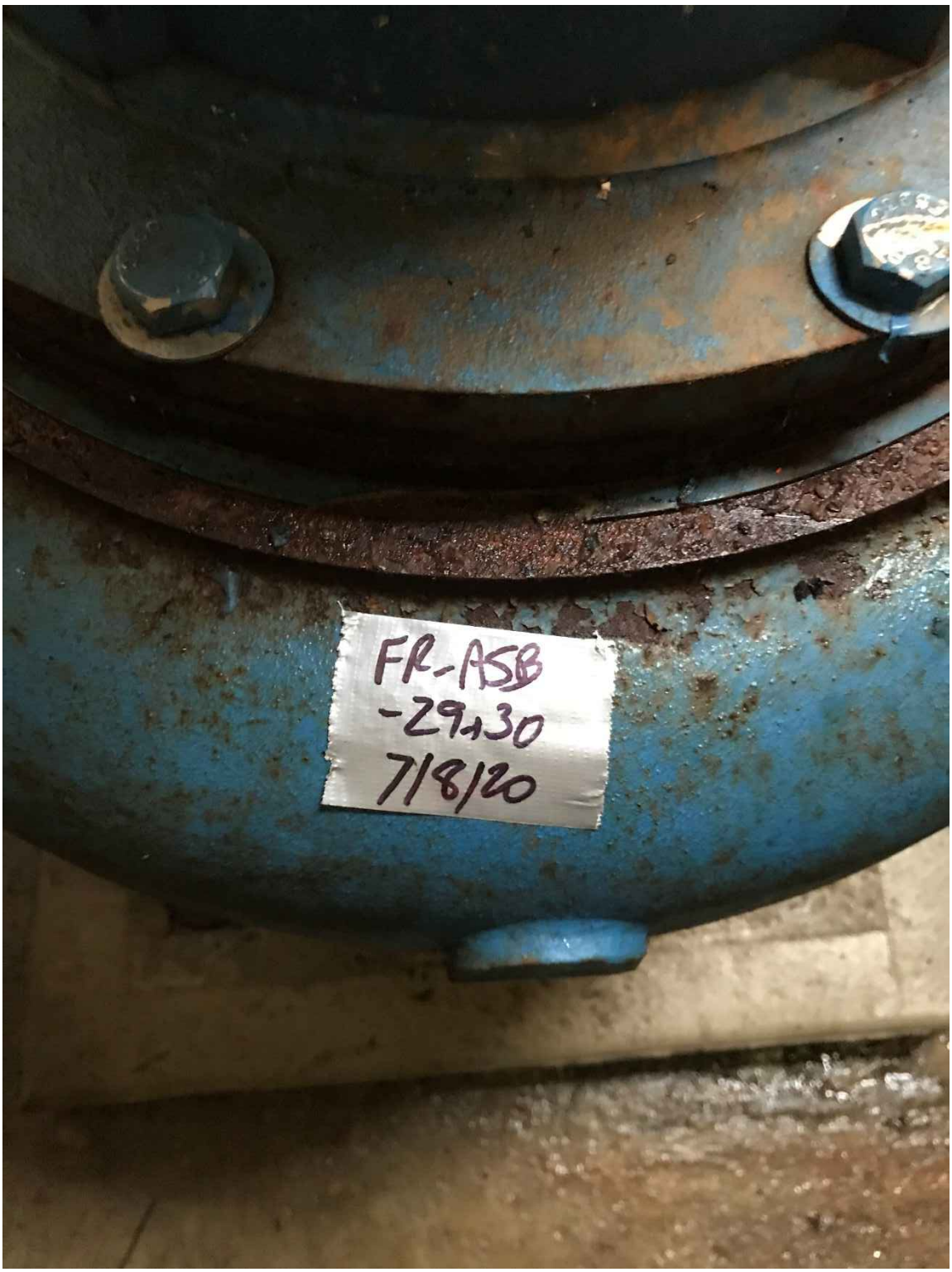
Photograph 1. Grey putty containing trace asbestos on roof vent seams at the Weaver Street Pump Station (WV-ASB-01&02).



Photograph 2. Black asbestos-containing mastic on the roof of the Fenimore Road Pump Station (WV-ASB-17&18).



Photograph 3. Grey asbestos-containing putty in conduit wall penetrations at the Fenimore Road Pump Station (WV-ASB-19&20).



Photograph 4. Grey fibrous asbestos-containing gasket in the blue sludge pump at the Fenimore Road Pump Station (WV-ASB-29&30).

Photograph 5. PCB-containing grey over red painted railing at the Fenimore Road Pump Station (FR-PCB-01).

Photograph 6. PCB-containing green painted vent piping at the Fenimore Road Pump Station (FR-PCB-02).

ATTACHMENT C

Bidwell Environmental LLC Asbestos Handling
License and Certifications

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

Bidwell Environmental, L.L.C.

P.O. Box 266

SugarLoaf, NY 10981

FILE NUMBER: 09-48940
LICENSE NUMBER: 48940
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 11/08/2019
EXPIRATION DATE: 11/30/2020

Duly Authorized Representative – Ellen Metzger:

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)

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S

MICHAEL L WELLOCK
CLASS(EXPIRES)
D INSP(06/20)

CERT# 12-14716
DMV# 819360714

MUST BE CARRIED ON ASBESTOS PROJECTS

New York State Department of Health Certificate of Asbestos Safety Training

This form is the official record of successful completion of a New York State accredited asbestos safety training course.

Certificate No. 865174

I –To be completed by Trainee

Name of Trainee (print)	NYS Depart. of Motor Vehicles ID (DMV ID)[1]	
Michael Wellock	819 360 714.	
Signature of Trainee	Telephone Number	Date of Birth[1]
	845-545-0411	06/02/1986.
Address		
15 Hillside Avenue (Street or PO Box)	Monroe (City)	NY (State) 10950 (Zip Code)

II—To be completed by Training Sponsor

Provider	Big Apple Occupational Safety Inc	Telephone Number
Address	505 Eighth Avenue # 2305 New York NY 10018	Course Location: Webinar.
Zip Code	212-564-7656 www.baos.com	

Course Title: Inspector ☐ Initial ☑ Refresher

NYS DOH use only ☐ DOH Equivalency [2]

Training Language: ☑ English ☐ Other: Exam Grade/Date: 92% 06/05/2020.

Dates of Training: From: 06/05/20 To: 06/05/20 Expires: 06/05/2021

I certify that the asbestos safety training course given on the above date complied with both 10 NYCRR Part 73 and TSCA Title II, was consistent with the curriculum and instructors approved by the New York State Department of Health, and the trainee receiving this certificate completed the training course and successfully passed the examination.

Training Director[2]: Ganapathy Subramaniam (Print) (Signature)

DOH-2832 (10/03) [1] Optional Information [2] DOH Equivalency signed by NYS DOH representative only

DEPT. OF LABOR

ATTACHMENT D

Mandell Lead Inspectors, Inc.

Lead Paint Inspection Report and Certificate

Mandell Lead Inspectors, Inc
MLI
dba

MANDELL ENVIRONMENTAL CONSULTING

409 MINNISINK ROAD • SUITE 102 • TOTOWA, NJ 07512 • (973) 785-7574 • FAX (973) 785-0561

LEAD PAINT INSPECTION REPORT

INSPECTION FOR: Bidwell Environmental, LLC
1353 Kings Highway
PO Box 266
Sugar Loaf, NY 10981

PERFORMED AT: Mammaroneck Valley and Ossining Sewer District
Fenimor Road, Weaver Street,
Archville and Country Club Road

INSPECTION DATE: 07/08/2020

INSTRUMENT TYPE: Hueresis Pb 2000i
XRF Lead-Based Paint Analyzer
Serial Number: 2609

OPERATOR LICENSE: NY/EPA Certification # LBP-R-5686-1

THIS REPORT IS NON TRANSFERABLE

The measurements contained within are accurate to the best of our knowledge. Mandell Lead Inspectors Inc. does not under any circumstances make any representation guarantee or warranty as to the reported or future condition of the property.

SIGNED: Stuart Casciano Date: 7-20-2020

Stuart A. Casciano
Mandell Lead Inspectors, Inc.
409 Minnisink Road, Suite 102
Totowa, NJ 07512
(973) 890-8800
NY/EPA Certification # LBP-2290-1

Summary

On July 8, 2020, Mandell Lead Inspectors, Inc. conducted a limited inspection for the possible presence of Lead-based Paint at the Mammaroneck Valley and Ossining Sewer District, Fenimor Road, Weaver Street, Archville and Country Club Road Sampling of selected areas was performed using a Hueresis Pb 2000i Lead Based Paint Analyzer. The inspection was conducted by Stuart A. Casciano NY/EPA Certification # LBP-R-5686-1

The XRF results section of this report provides a listing of all the readings collected during the inspection, organized by room and structure type. A representative number of samples were collected from each distinguishable color and accessible component (i.e., walls, ceiling, flooring, piping, and equipment), identified during the survey. Each XRF reading location is identified on the field sketches attached to the report. Please note that while lead-based paints are defined by the US Department of Housing and Urban Development as paints containing 1.0 mg/cm2 or above, painted surfaces containing any detectable concentration of lead may create lead-contaminated dusts, fumes or soil if the paint is disturbed during future construction efforts at the sites. When reviewing the reports please consider that XRF readings were only collected on representative painted surfaces which were visible to the inspector at the time of the inspection and accessible without the use of specialized equipment. The overall condition of the painted surfaces at these locations is also provided.

The enclosed information will primarily assist you in identifying the location(s) of lead-based and lead-containing paint on the exterior and interior painted surfaces tested during the inspection. It should not be used to assess whether an individual has been exposed to harmful levels of lead.

XRF RESULTS

EXPLANATION OF TERMS AND ABBREVIATIONS

The following information has been provided to assist you with the attached Lead-Based Paint Inspection Report.

Action Level – The level at or above which any paint, shellac, varnish, or other coating is considered to be lead-based and, consequently, appropriate abatement and/or interim control measures should be considered. Currently, the action level as outlined in State and Federal guidelines is 1.0 milligrams/square centimeter (1.0 mg/cm2) as measured by X-Ray Fluorescence (XRF) testing, or 0.5% by weight as measured by laboratory analysis.

Reading No. – Corresponds to a specific XRF measurement as taken in a numerical sequence during the inspection.

Surface – The general location of a measurement relative to a wall on the exterior of the house or within a particular room. Wall A corresponds to the front entry wall, while walls B through D are identified proceeding in a clockwise direction.

Structure – A major component such as a window, wall, or staircase located inside or outside of the house, upon which a measurement or set of measurements were collected.

Location – The specific area on a structure where a measurement was collected.

Member – A portion of a structure such as a window jam, door header, or stair riser where a measurement was collected.

Friction Surface – Any interior or exterior surface such as a window, stair tread, or floor subject to friction or abrasion.

Impact Surface – An interior or exterior surface such as surfaces on doors subject to damage by repeated impact or contact.

Paint Condition – A subjective classification of the condition of a painted surface upon which a measurement was collected. Paint is classified into one of two categories that include "sound" or "unsound". A "sound" surface is considered to be completely intact and free from any visible signs of damage or deterioration. All other surfaces are considered "unsound". Regardless of the paint condition at the time of inspection, all friction and impact surfaces are considered "unsound" due to the ongoing generation of dust that is inherent to these surfaces during use. If test results indicate the presence of lead-based paint, particularly on an "unsound" surface, steps should be taken to establish and maintain a lead-safe condition.

I = Intact: Paint surface is smooth, continuous and free of surface defect that would result in the release of paint dust or chips.

F=Fair: Large surfaces – a surface where less than or equal to two square feet of surface are not intact. Areas without large surfaces - surface where less than or equal to 10 percent of the surface is not intact.

P=Poor: Large surfaces – a surface where more than two square feet of surface are not intact. Areas without large surfaces – surface where more than 10 percent of the surface is not intact.

Mode – The Niton XRF instrument used to perform the lead-based paint inspection reports the total lead concentration in mg/cm2.

Reading #	Job Id	Room	Wall	Component	Substrate	Paint Condition	Color	Concentration	Units	Result
1	Weaver	Calibration						1	mg/cm2	
2	Weaver	Calibration						1.1	mg/cm2	
3	Weaver	Calibration						1	mg/cm2	
4	Weaver	Calibration						0	mg/cm2	
5	Weaver	Calibration						0	mg/cm2	
6	Weaver	Calibration						-0.2	mg/cm2	
7	Weaver	Exterior	B	Generator Support	Metal	Deteriorated	Brown	0.2	mg/cm2	Negative
8	Weaver	Exterior	B	Generator Cover	Metal	Deteriorated	Brown	-0.1	mg/cm2	Negative
9	Weaver	Exterior	B	Valve	Metal	Deteriorated	Grey	0.2	mg/cm2	Negative
10	Weaver	Exterior	B	Hood	Metal	Deteriorated	Grey	0.1	mg/cm2	Negative
11	Weaver	Exterior	B	Hood	Metal	Deteriorated	Grey	0.1	mg/cm2	Negative
12	Weaver	Exterior	B	Door Hatch	Metal	Deteriorated	Grey	0.1	mg/cm2	Negative
13	Weaver	Exterior	B	Generator	Metal	Deteriorated	Green	0.1	mg/cm2	Negative
14	Weaver	Exterior	B	Floor	Concrete	Deteriorated	Grey	0.1	mg/cm2	Negative
15	Weaver	Exterior	B	Pipe	Metal	Deteriorated	Black	0	mg/cm2	Negative
16	Weaver	Elevation 5.875	D	Stair Stringer	Metal	Intact	Blue	0.1	mg/cm2	Negative
17	Weaver	Elevation 5.875	D	Stair Stringer	Metal	Intact	Blue	0.2	mg/cm2	Negative
18	Weaver	Elevation 5.875	D	Pipe	Metal	Deteriorated	Red	0.2	mg/cm2	Negative
19	Weaver	Elevation 5.875	D	Pipe	Metal	Deteriorated	Grey	0	mg/cm2	Negative
20	Weaver	Elevation 5.875	A	Electric Panel	Metal	Intact	Grey	0	mg/cm2	Negative
21	Weaver	Elevation 5.875	A	Control Panel	Metal	Intact	Grey	0.1	mg/cm2	Negative
22	Weaver	Elevation 5.875	B	Control Panel	Metal	Intact	Grey	0	mg/cm2	Negative
23	Weaver	Elevation 5.875	C	Heater	Metal	Intact	Tan	0	mg/cm2	Negative
24	Weaver	Elevation 5.875	C	Motor	Metal	Intact	Green	0.1	mg/cm2	Negative
25	Weaver	Elevation -3.5	C	Beam	Metal	Deteriorated	Blue	0.1	mg/cm2	Negative
26	Weaver	Elevation -3.5	C	Beam	Metal	Deteriorated	Blue	0.1	mg/cm2	Negative
27	Weaver	Elevation -3.5	B	Pipe	Metal	Deteriorated	Grey	0.3	mg/cm2	Negative
28	Weaver	Elevation -3.5	B	Valve	Metal	Deteriorated	Grey	0.1	mg/cm2	Negative
29	Weaver	Elevation -16.25	A	Pump	Metal	Intact	Black	0.3	mg/cm2	Negative
30	Weaver	Elevation -16.25	A	Pump	Metal	Intact	Black	0.1	mg/cm2	Negative
31	Weaver	Elevation -16.25	A	Pump Base	Metal	Intact	Black	0.2	mg/cm2	Negative
32	Weaver	Elevation -16.25	C	Disconect Switch	Metal	Intact	Grey	0	mg/cm2	Negative

33	Weaver	Elevation -16.25	B	Valve Wheel	Metal	Intact	Blue	0.1 mg/cm2	Negative
34	Weaver	Elevation -16.25	B	Valve	Metal	Intact	Blue	0 mg/cm2	Negative
35	Weaver	Exterior	D	Disconect Switch	Metal	Intact	Grey	0.1 mg/cm2	Negative
36	Weaver	Exterior	D	Compressor	Metal	Intact	Green	0.1 mg/cm2	Negative
37	Weaver	Calibration						1 mg/cm2	
38	Weaver	Calibration						1.1 mg/cm2	
39	Weaver	Calibration						1 mg/cm2	
40	Weaver	Calibration						0.1 mg/cm2	
41	Weaver	Calibration						0.1 mg/cm2	
42	Weaver	Calibration						0 mg/cm2	
43	Fenimore	Calibration						1 mg/cm2	
44	Fenimore	Calibration						1.1 mg/cm2	
45	Fenimore	Calibration						1 mg/cm2	
46	Fenimore	Calibration						0.1 mg/cm2	
47	Fenimore	Calibration						0 mg/cm2	
48	Fenimore	Calibration						0.1 mg/cm2	
49	Fenimore	Exterior	A	Fence	Metal	Intact	Black	0.1 mg/cm2	Negative
50	Fenimore	Exterior	C	Fence	Metal	Intact	Black	0 mg/cm2	Negative
51	Fenimore	Exterior	C	Fence	Metal	Intact	Black	0.1 mg/cm2	Negative
52	Fenimore	Exterior	B	Generator Support	Metal	Intact	Green	0.2 mg/cm2	Negative
53	Fenimore	Exterior	B	Generator Support	Metal	Intact	Green	0.2 mg/cm2	Negative
54	Fenimore	Exterior	B	Generator	Metal	Intact	Green	0.1 mg/cm2	Negative
55	Fenimore	Exterior	C	Pipe	Metal	Deteriorated	Green	1.7 mg/cm2	Positive
56	Fenimore	Exterior	C	Pipe	Metal	Deteriorated	Green	4.5 mg/cm2	Positive
57	Fenimore	Exterior	A	Pipe	Metal	Deteriorated	Green	0.9 mg/cm2	Negative
58	Fenimore	Exterior	A	Pipe	Metal	Deteriorated	Green	6 mg/cm2	Positive
59	Fenimore	Exterior	A	Vent Base	Metal	Deteriorated	Green	0.4 mg/cm2	Negative
60	Fenimore	Exterior	A	Vent Base	Metal	Deteriorated	Green	2.9 mg/cm2	Positive
61	Fenimore	Exterior	A	Vent Base	Metal	Deteriorated	Green	1.9 mg/cm2	Positive
62	Fenimore	Exterior	A	Valve	Metal	Deteriorated	Green	0.3 mg/cm2	Negative
63	Fenimore	Exterior	A	Valve Base	Concrete	Deteriorated	Green	0.3 mg/cm2	Negative
64	Fenimore	Exterior	D	Curb	Concrete	Deteriorated	Green	0.2 mg/cm2	Negative
65	Fenimore	Exterior	D	Bracket	Metal	Deteriorated	Green	1.5 mg/cm2	Positive
66	Fenimore	Exterior	D	Bracket	Metal	Deteriorated	Green	2.8 mg/cm2	Positive

67	Fenimore	Upper Level	D	Pipe	Metal	Intact	Grey	0.1 mg/cm2	Negative
68	Fenimore	Upper Level	C	Pipe	Metal	Intact	Grey	0.2 mg/cm2	Negative
69	Fenimore	Upper Level	C	Valve	Metal	Intact	Grey	-0.3 mg/cm2	Negative
70	Fenimore	Upper Level	C	Railing	Metal	Intact	Grey	1.6 mg/cm2	Positive
71	Fenimore	Upper Level	C	Railing	Metal	Intact	Red	1.5 mg/cm2	Positive
72	Fenimore	Upper Level	C	Railing	Metal	Intact	Grey	0.9 mg/cm2	Negative
73	Fenimore	Upper Level	B	Pipe	Metal	Intact	Red	0.2 mg/cm2	Negative
74	Fenimore	Upper Level	B	Pipe	Metal	Intact	Red	0.5 mg/cm2	Negative
75	Fenimore	Upper Level	A	Electric Panel	Metal	Intact	Grey	0 mg/cm2	Negative
76	Fenimore	Upper Level	A	Control Panel	Metal	Intact	Grey	0.1 mg/cm2	Negative
77	Fenimore	Upper Level	A	Beam	Concrete	Intact	Grey	0.2 mg/cm2	Negative
78	Fenimore	Upper Level	A	Beam	Concrete	Intact	Grey	0.2 mg/cm2	Negative
79	Fenimore	Upper Level	B	Beam	Concrete	Intact	Grey	0.2 mg/cm2	Negative
80	Fenimore	Upper Level	C	Valve Wheel	Metal	Intact	Black	0 mg/cm2	Negative
81	Fenimore	Lower Level	C	Pump	Metal	Intact	Blue	0.1 mg/cm2	Negative
82	Fenimore	Lower Level	C	Pump	Metal	Intact	Blue	0.1 mg/cm2	Negative
83	Fenimore	Lower Level	C	Pump	Metal	Intact	Blue	0.1 mg/cm2	Negative
84	Fenimore	Lower Level	C	Pump Motor	Metal	Intact	Blue	0.1 mg/cm2	Negative
85	Fenimore	Lower Level	C	Pump Motor	Metal	Intact	Blue	0.1 mg/cm2	Negative
86	Fenimore	Lower Level	C	Pump Motor	Metal	Intact	Blue	0.1 mg/cm2	Negative
87	Fenimore	Lower Level	C	Valve	Metal	Intact	Red	0.4 mg/cm2	Negative
88	Fenimore	Lower Level	C	Valve	Metal	Intact	Red	-0.1 mg/cm2	Negative
89	Fenimore	Lower Level	A	Pipe	Metal	Intact	Grey	0.2 mg/cm2	Negative
90	Fenimore	Lower Level	A	Pipe	Metal	Intact	Grey	-0.9 mg/cm2	Negative
91	Fenimore	Lower Level	A	Pipe	Metal	Intact	Grey	0.2 mg/cm2	Negative
92	Fenimore	Lower Level	C	Pump Support	Metal	Intact	Grey	0.1 mg/cm2	Negative
93	Fenimore	Lower Level	C	Pump Support	Metal	Intact	Grey	0.1 mg/cm2	Negative
94	Fenimore	Upper Level	A	Conduit	Metal	Intact	Grey	0.2 mg/cm2	Negative
95	Fenimore	Upper Level	A	Conduit	Metal	Intact	Grey	0.4 mg/cm2	Negative
96	Fenimore	Upper Level	B	Conduit	Metal	Intact	Grey	0.1 mg/cm2	Negative
97	Fenimore	Exterior	C	Slab	Concrete	Deteriorated	Black	0.1 mg/cm2	Negative
98	Fenimore	Exterior	C	Slab	Concrete	Deteriorated	Black	0.1 mg/cm2	Negative
99	Fenimore	Exterior	C	Slab	Concrete	Deteriorated	Black	0.3 mg/cm2	Negative
100	Fenimore	Exterior	B	Generator	Metal	Intact	Tan	0.1 mg/cm2	Negative

101	Fenimore	Exterior	B	Generator	Metal	Intact	Tan	-0.2	mg/cm2	Negative
102	Fenimore	Exterior	B	Generator	Metal	Intact	Tan	0.3	mg/cm2	Negative
103	Fenimore	Calibration						1	mg/cm2	
104	Fenimore	Calibration						0.9	mg/cm2	
105	Fenimore	Calibration						1	mg/cm2	
106	Fenimore	Calibration						0.1	mg/cm2	
107	Fenimore	Calibration						0.1	mg/cm2	
108	Fenimore	Calibration						0.1	mg/cm2	
109	Archville	Calibration						1	mg/cm2	
110	Archville	Calibration						1	mg/cm2	
111	Archville	Calibration						1	mg/cm2	
112	Archville	Calibration						-0.1	mg/cm2	
113	Archville	Calibration						0.1	mg/cm2	
114	Archville	Calibration						0	mg/cm2	
115	Archville	Exterior	B	Pipe	Metal	Deteriorated	Black	0.1	mg/cm2	Negative
116	Archville	Exterior	B	Pipe	Metal	Deteriorated	Black	0.1	mg/cm2	Negative
117	Archville	Exterior	B	Pipe	Metal	Deteriorated	Black	0.1	mg/cm2	Negative
118	Archville	Exterior	C	Fence	Metal	Deteriorated	Green	0.3	mg/cm2	Negative
119	Archville	Exterior	C	Fence	Metal	Deteriorated	Green	0.4	mg/cm2	Negative
120	Archville	Exterior	A	Fence	Metal	Deteriorated	Green	0.5	mg/cm2	Negative
121	Archville	Exterior	C	Control Panel	Metal	Intact	Grey	0.1	mg/cm2	Negative
122	Archville	Exterior	C	Control Panel	Metal	Intact	Grey	0.1	mg/cm2	Negative
123	Archville	Exterior	C	Control Panel	Metal	Intact	Grey	0.1	mg/cm2	Negative
124	Archville	Exterior	D	Generator Base	Metal	Intact	Black	0.1	mg/cm2	Negative
125	Archville	Exterior	D	Generator Base	Metal	Intact	Black	0.2	mg/cm2	Negative
126	Archville	Exterior	D	Generator Base	Metal	Intact	Black	0.1	mg/cm2	Negative
127	Archville	Exterior	D	Generator Cover	Metal	Intact	Tan	-0.1	mg/cm2	Negative
128	Archville	Exterior	D	Generator Cover	Metal	Intact	Tan	-0.3	mg/cm2	Negative
129	Archville	Exterior	D	Generator Cover	Metal	Intact	Tan	0.1	mg/cm2	Negative
130	Archville	Exterior	D	Generator	Metal	Intact	Tan	0.1	mg/cm2	Negative
131	Archville	Exterior	D	Generator	Metal	Intact	Tan	0.2	mg/cm2	Negative
132	Archville	Exterior	D	Generator	Metal	Intact	Tan	0	mg/cm2	Negative
133	Archville	Exterior	D	Panel	Metal	Intact	Tan	0	mg/cm2	Negative
134	Archville	Exterior	D	Panel	Metal	Intact	Tan	0.1	mg/cm2	Negative

135	Archville	Exterior	D	Panel	Metal	Intact	Tan	0.1	mg/cm2	Negative
136	Archville	Exterior	A	Manhole	Metal	Intact	Orange	0.2	mg/cm2	Negative
137	Archville	Exterior	A	Manhole	Metal	Intact	Orange	0.4	mg/cm2	Negative
138	Archville	Exterior	A	Manhole	Metal	Intact	Orange	0.2	mg/cm2	Negative
139	Archville	Exterior	B	Valve Box	Metal	Intact	Black	-0.1	mg/cm2	Negative
140	Archville	Exterior	B	Valve Box	Metal	Intact	Black	0.1	mg/cm2	Negative
141	Archville	Exterior	B	Valve Box	Metal	Intact	Black	-0.1	mg/cm2	Negative
142	Archville	Exterior	B	Power Center	Metal	Intact	White	0.1	mg/cm2	Negative
143	Archville	Exterior	B	Power Center	Metal	Intact	White	-0.1	mg/cm2	Negative
144	Archville	Exterior	B	Power Center	Metal	Intact	White	-0.1	mg/cm2	Negative
145	Archville	Calibration						1	mg/cm2	
146	Archville	Calibration						1	mg/cm2	
147	Archville	Calibration						1	mg/cm2	
148	Archville	Calibration						0	mg/cm2	
149	Archville	Calibration						0	mg/cm2	
150	Archville	Calibration						0	mg/cm2	
151	C. Club	Calibration						1.1	mg/cm2	
152	C. Club	Calibration						1	mg/cm2	
153	C. Club	Calibration						1	mg/cm2	
154	C. Club	Calibration						0.1	mg/cm2	
155	C. Club	Calibration						0.1	mg/cm2	
156	C. Club	Calibration						0.1	mg/cm2	
157	C. Club	Exterior	A	Control Panel	Metal	Intact	Green	0	mg/cm2	Negative
158	C. Club	Exterior	A	Control Panel	Metal	Intact	Green	0.1	mg/cm2	Negative
159	C. Club	Exterior	A	Control Panel	Metal	Intact	Green	0	mg/cm2	Negative
160	C. Club	Exterior	A	Pipe	Metal	Intact	Green	0.1	mg/cm2	Negative
161	C. Club	Exterior	A	Pipe	Metal	Intact	Green	-0.5	mg/cm2	Negative
162	C. Club	Exterior	A	Pipe	Metal	Intact	Green	-0.2	mg/cm2	Negative
163	C. Club	Exterior	A	Disconect Switch	Metal	Intact	Grey	-0.1	mg/cm2	Negative
164	C. Club	Exterior	A	Panel	Metal	Intact	Grey	0.2	mg/cm2	Negative
165	C. Club	Exterior	A	Panel	Metal	Intact	Grey	-0.2	mg/cm2	Negative
166	C. Club	Exterior	A	Interior Wall	Metal	Intact	White	0.1	mg/cm2	Negative
167	C. Club	Exterior	A	Interior Wall	Metal	Intact	White	0.1	mg/cm2	Negative
168	C. Club	Exterior	A	Interior Wall	Metal	Intact	White	0.1	mg/cm2	Negative

169	C. Club	Exterior	A	Power Center	Metal	Intact	White	-0.1 mg/cm2	Negative
170	C. Club	Exterior	A	Power Center	Metal	Intact	White	-0.1 mg/cm2	Negative
171	C. Club	Exterior	A	Power Center	Metal	Intact	White	0 mg/cm2	Negative
172	C. Club	Calibration						1 mg/cm2	
173	C. Club	Calibration						1 mg/cm2	
174	C. Club	Calibration						1 mg/cm2	
175	C. Club	Calibration						0 mg/cm2	
176	C. Club	Calibration						0.1 mg/cm2	
177	C. Club	Calibration						0 mg/cm2	

United States Environmental Protection Agency

This is to certify that

Stuart A Casciano

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:

Risk Assessor

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 April 27, 2021

LBP-R-5686-1
Certification #

February 21, 2018
Issued On

John Gorman, Chief
Pesticides & Toxic Substances Branch